LEVEL IV

(12)

AD A098471

EARTHQUAKE POTENTIAL OF THE ST. LOUIS DISTRICT

MAIN REPORT
AND APPENDICES

US Army Corps
of Engineers
St. Louis District

FEBRUARY 1981

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER / 2. GOVT ACCESSION NO. AD-A098 471	3. RECIPIENT'S CATALOG NUMBER
4. ~~TITLE (and Subtitle)~~ EARTHQUAKE POTENTIAL OF THE ST. LOUIS DISTRICT. Main Report and Appendices	5. TYPE OF REPORT & PERIOD COVERED Final Report
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Gregory L. Hempen, Michael J. Klosterman ~~U. S. Army Engineer District, St. Louis~~; John D. Rockaway, Gerald B. Rupert University of Missouri - Rolla	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer District, St. Louis Foundation & Materials Branch 210 Tucker Blvd., North, St. Louis, MO 63101	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer District, St. Louis Foundation & Materials Branch 210 Tucker Blvd., North, St. Louis, MO 63101	12. REPORT DATE February 1981
	13. NUMBER OF PAGES 104
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) 12 123	15. SECURITY CLASS. (of this report) UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Geology
Seismology
Tectonics
Seismotectonic zonation
Design earthquake
Earthquake recurrence

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

An analysis of geological factors was used in conjunction with a mathematical appraisal of seismological data to assess the earthquake potential within a portion of the central United States. These two approaches complemented each other since they used diverse sources to obtain their facts and premises. Earthquake potential was assessed using the concept of seismotectonic zones because of the difficulty in determining active faults in the central United States. Eight zones were resolved based on an analysis of geologic and

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

A

UNCLASSIFIED

411531

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

20. ABSTRACT (cont'd)

seismic history, structural, tectonic, stratigraphic, and petrologic features, geophysical and seismological data, and midcontinent tectonic models. The resolution of the zones was an iterative process of geologically bounding the zones, assessing the historic seismicity, and determining the recurrence rates. Each of the eight zones was intended to be geologically and seismologically unique. Maximum credible (MCE) and operating basis (OBE) earthquakes were determined for each zone. The MCE was a judgmental value refined by comparing the geologic features, tectonic framework, historic seismicity, and recurrence characteristics of the various seismic zones. The OBE was based on a statistical evaluation of the seismic history and the certainty of earthquake occurrence.

DISCLAIMER NOTICE

THIS DOCUMENT IS BEST QUALITY PRACTICABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

12

EARTHQUAKE POTENTIAL

OF ST. LOUIS DISTRICT

ST. LOUIS DISTRICT

CORPS OF ENGINEERS

FEBRUARY 1981

TABLE OF CONTENTS

LIST OF TABLES

LIST OF PLATES

EARTHQUAKE POTENTIAL OF ST. LOUIS DISTRICT

INTRODUCTION

The St. Louis District, Corps of Engineers is required by ER 1110-2-1806 to evaluate the stability of those dams where earthquake-induced ground motion could cause damage. The initial step of such an analysis is to determine the potential for earthquakes near each project. Since a large earthquake occurring in the central United States could affect several District projects, this single regional study was performed. The area analyzed in the study was approximately between 35° N to 43° N latitude and 83° W to 98° W longitude.

The correlation of a given fault with a specific level of seismic activity is not feasible in the central United States. With the exception of the New Madrid earthquake sequence of 1811-12, no historic earthquakes have produced observable surface movement in the region. However, trends can be recognized in the distribution of historic earthquakes, which implies that genetic relationships exist. It is more meaningful to describe seismicity in terms of zones which have been defined by historic earthquakes and geologic parameters for the central United States. Zonation of the study area followed the approach developed by Gubin (1967) and used in zonation for nuclear power plants. The first phase of this study was to compile and analyze existing geological, geophysical, and seismological data. The information was used to determine zone boundaries and the level of seismic activity present in each zone. In order to minimize bias toward any one field of data, an interdisciplinary team of Corps personnel was formed to evaluate the data and define the zones.

The results of the first phase of this study were then used to determine design earthquakes for District projects. Two distinct design earthquakes were determined for each zone. The maximum credible earthquake (MCE) is the largest earthquake that reasonably can be expected to occur. Design of an important structure for the MCE should insure that the structure does not fail catastrophically. The second design event is the operating basis earthquake (OBE) which is the largest earthquake which can be expected to occur during the life of the project. Important structures should be designed to insure that the OBE will not prevent their operation.

GEOLOGICAL AND SEISMOLOGICAL PARAMETERS

Geological, geophysical, and seismological data were collected and analyzed to evaluate the earthquake potential of the region. In addition to a thorough literature review, the study used information from the ongoing New Madrid Seismotectonic Study sponsored by the Nuclear Regulatory Commission. The study chairman, Dr. Thomas Buschbach, furnished considerable assistance. Drs. Otto Nuttli and Robert Herrmann, St. Louis University, also made themselves available for discussion throughout the course of the study. The State Geological Surveys of Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Missouri, Ohio, Oklahoma, and Tennessee furnished assistance in the form of maps, publications, and discussions. Preliminary Safety Analysis Reports of Arkansas Two (AK), Braidwood (IL), Callaway (MO), Clinton (IL),

Marble Hill (IN), and Wolf Creek (KS) nuclear power plants also proved extremely valuable.

It is beyond the scope of this report to present all the information and concepts contained in the literature. However, pertinent data used in preparation of this report are presented as appendices and plates at the end of the text. Those geological and seismological parameters used to determine the source zones are briefly described below. All references for this study are presented in Appendix C.

Geologic and Tectonic History: Past tectonic events are recorded by the geologic structure of the region. Thus, geologic history provides an understanding of the present tectonic regime.

Basins, Arches, and Domes: These structures (plate 1/13) indicate past tectonic activity. The boundaries, axes, and intersections of these structures may also act as zones of crustal weakness which influence the contemporary stress field.

Precambrian Features: The tectonic features defined by the sedimentary strata indicate the structural features which are present in the underlying Precambrian surface. Ancient zones of weakness in the Precambrian surface may be reactivated in response to a change in the existing stress regime. Thus, the structural geology of the Precambrian basement is important in understanding the relationship between tectonic features and seismicity. The causative faults must also lie in the Precambrian, because the foci of most central United States earthquakes have been located near the Precambrian surface. Plate 2/13 illustrates various tectonic structures on the Precambrian Basement.

Stratigraphic Contours: The boundaries of any structural feature can be dependent upon the stratigraphic unit used to determine the feature. Comparison of stratigraphic contours from varying depths give an indication of the change in a tectonic feature--and thus the stress regime--over geologic time.

Faults and Lineations: These structures are the most obvious indicator of past tectonism. In addition, faults (plate 3/13) may influence the present stress field. A preferentially oriented unhealed fault zone, formed during an earlier tectonic period, may be reactivated under a favorably oriented contemporary stress regime. There is no consistent relationship between young structural features and old zones of weakness. Some old fault zones have not been reactivated by younger faults and younger faults may not reflect old zones of weakness.

Active Faulting: Earthquakes are a sudden release of energy caused by movement along a fault. Active faults, whether exposed at the surface or buried in the subsurface, must be considered as potential earthquake sources (Russ, 1979 and Zoback, 1979). Properly instrumented active faults can also provide insight into the existing stress regime.

Historic Seismicity: The distribution of past earthquakes may be used to define the present zones of seismic activity. An analysis of the seismic record also provides the magnitude and frequency of future events. The seismic record was used to plot epicenter locations (plate 4/13), event density contours (plates 5 and 6/13), large historic earthquakes (plate 7/13), and cumulative isoseismal contours (plates 8 and 9/13).

Microearthquakes: The infrequent occurrence of major earthquakes in the central United States makes it difficult to understand the seismotectonic regime. Since microearthquakes occur more frequently, they may be used to supplement the earthquake record. They also serve to locate active fault zones not exposed at the surface, to determine predominant regional focal mechanisms, and to better understand magnitude-recurrence relations.

Gravity and Magnetics: Gravity and magnetic contours may be used to reveal faults, rifts, and buried igneous intrusives not visible at the surface. Earthquake sources frequently are related to high anomaly gradients and the area between positive and negative anomalies (Braile, et al, 1979 and Hinze, et al, 1979). The New Madrid Seismic Study Group has developed the most comprehensive gravity and magnetic maps (Plate 10/13) for this region to date (Keller, et al, 1980; Johnson, et al, 1980).

Alkalic Extrusives and Intrusives: Alkalic ultramafic rocks are considered to have their origin in the upper mantle. Their presence thus indicates a deep rupture in the earth's crust. Buried plutonic bodies may create anomalous stress conditions (Sargent & Lundy, 1975). In the central and eastern United States, some seismic activity appears to be associated with ultramafic rocks (McKeown, 1978).

Isostatic Adjustment: Regional loading or unloading of the crust causes isostatic adjustments which may produce seismic activity. Various mechanisms have been proposed: recession of the Wisconsin glacier, seasonal change of water load in alluvial valleys, increasing load of Cenozoic sediments, and injection of high density instrusive rocks.

Regional Stress: There is considerable evidence indicating that earthquakes in continental interiors are controlled by zones of crustal weakness in the presence of high deviatoric stress (Hinze, 1977). Determination of the orientation and character (compression/tension) of the stress and the type of fault movement (normal, thrust, strike-slip, oblique) is of prime importance in understanding seismic activity.

Focal Mechanism Studies: A common method of obtaining regional stress information is by means of focal plane solutions of earthquakes. Fault plane solutions also can be used to identify active faults not visible at the surface, when data for several events is available.

Tectonic Models: In the central United States, seismic activity cannot be directly related to specific geologic features. In this region, resolution of seismic zones is partially dependent on the development of models which can explain past and present tectonic activity. Such models

should be compatible with the concept of intraplate tectonics and must integrate all of the parameters discussed above.

Previous Seismic Zoning: Other investigators have suggested parameters from which zones should be established, zone boundaries delineated, and design earthquakes resolved. Studies by Gubin (1967), Housner & Jennings (1973), Kulhawy & Ninyo (1977) and Richter (1959) have been utilized to develop the methodology followed by this study. The most significant zonation works for this region have been three nuclear power plant reports (Illinois Power Company, 1974, Public Service Indiana, 1975, and Union Electric Company, 1974), plate 11/13; and Hadley & Devine (1974a,b,c) and Nuttli & Herrmann (1978b), plate 12/13.

EARTHQUAKE RECURRENCE

The list of historic earthquakes was divided among each of the seismic zones, and recurrence curves were prepared for each zone. These curves were developed both to compare recurrence characteristics of the various seismic zones, and to determine the OBE for each zone. Recurrence curves were not used directly to determine the MCE. Justification for statistical analysis of recurrence is based on the assumption that earthquakes occur at some regular rate and magnitude throughout the historic time period. Details of the recurrence statistics are presented in Appendix B.

The list of historic earthquakes for each zone was compiled. Foreshocks, aftershocks, and swarms were eliminated from the record as recommended by Chiburis (1979). The data also was analyzed to define the time period for which the historic record of each zone could be considered complete. Completeness was evaluated by techniques developed by Chiburis (1979), Nuttli (1974a), and Stepp (1973). Only earthquakes occurring within these periods of record were used to prepare the recurrence curves.

The recurrence curves were developed for each zone by comparing the body-wave magnitude to the log of the number of earthquakes per year equaling or exceeding that magnitude. Recurrence curves were determined by four procedures: least squares regression, linear regression constrained to a point (in some cases this fit was not used), linear regression constrained to a slope, and weighted least squares regression. When the fit was constrained to a point, the point of constraint was the previously determined MCE magnitude selected to occur once in 1,000 years. When the fit was constrained to a slope, the slope used was -0.92. Nuttli & Herrmann (1978b) recommend this slope for the central United States. One zone (Central US Random) was normalized to an area of 100,000 square kilometers, so that the occurrence of earthquakes in each zone could be compared with respect to area (Nuttli & Herrmann, 1978b).

A variety of statistics was used to evaluate the four recurrence curve fits developed for each zone (Appendix B). Correlation coefficients and standard errors of estimates were used to assess the fit of the curves to the data points. Significance tests, using the "t distribution" procedure, were used to compare the hypothetical -0.92 slope to that determined for the least squares regression. These tests indicated the earthquake record for some

source zones does not fit this hypothetical slope well. The lack of numerical agreement further supports the concept that slopes differ between zones.

DESIGN EARTHQUAKES

Maximum credible and operating basis earthquakes were determined for each zone. The selection of the MCE was based upon the judgment of the study team and was not a statistically determined value. It was defined by comparing the geologic features, tectonic framework, seismic history, and the recurrence characteristics of the various seismic zones. The MCE selected for each zone was considered to be the largest earthquake that reasonably could be expected to occur in that zone. The MCE exceeded the maximum historic earthquake of the zone in all cases.

The OBE for each zone was based on a statistical evaluation of the seismic history and the certainty of earthquake occurrence (Appendix B). The OBE was chosen to be the 100-year earthquake defined by "t distribution" at a 95 percent confidence interval. A sample OBE was computed from the fit which passed through the MCE magnitude at 1000 years. The OBE for a zone was restricted to be greater than the largest historic event (last 160 years) and less than the 500-year earthquake. The 500-year event has an 82 percent likelihood of not being exceeded in a 100 year period.

Earthquake hazards of a project will be assessed by evaluating the design earthquakes for each zone. The anticipated ground motion at a site can be determined by attenuating the ground motion of a design event. Unless a potentially active fault is found nearby, no design event is placed at the site.

SEISMOTECTONIC ZONES

The study area is subdivided into the eight seismotectonic zones, shown in plate 13/13. The boundaries of the zones reflect the interrelationship of epicenter distribution, event density, earthquake size, magnitude-recurrence relations, microearthquake distribution, geologic/tectonic history, folds, faults, tectonic features, basement configuration, geophysical anomalies, occurrence of alkalic ultramafic rocks, and regional stress characteristics. The following paragraphs discuss the boundaries, characteristics, and design earthquakes for each zone. The body-wave magnitude, m_b, and maximum Modified Mercalli Intensity, I_o, have been assessed for design events.

Anna, Ohio

There is an area of moderately high seismicity located near Anna, Ohio, within the relatively stable Indiana-Ohio Platform. Because of its uniqueness, this area has been investigated in detail (Public Service Indiana, 1975, p. 2E.1-1.). The boundaries of this zone are based on the location of magnetic anomalies, a change in gravity gradients, basement faulting, a change in basement petrology, and earthquake density. The zone is near the intersection of the Cincinnati, Kankakee, and Findlay Arches which may modify the regional stress field, thus producing a local zone of

stress accumulation and release. The zone is characterized by east-northeast horizontal compression with fault plane solutions indicating reverse movement along a north-south zone of weakness (Public Service Indiana, 1975).

This zone has experienced 2.5 earthquakes per 1000 km^2 adjusted for the last 100 years. The maximum known earthquake is m_b = 5.3 (I_o = VIII) with four other events occurring between m_b = 5.0 and 5.3. The paucity of historic earthquakes in this zone produced anomalous earthquake recurrence statistics which were not further evaluated. The MCE determined for this zone is m_b = 6.4 (I_o = IX-X); the OBE is m_b = 6.1 (I_o = IX) which is equivalent to the 500-year event.

Southern Illinois - Wabash

The southeastern and structurally lowest portion of the Illinois Basin exhibits greater seismicity than the surrounding area. It contains the Precambrian Fairfield Basin and the Wabash Fault Zone. This zone is bordered on the north by gravity anomalies and east-west trending magnetic contours. The eastern border is defined by the northern extent of the east Mississippi gravity and magnetic high. The southern border is based on a steeply dipping, east-west trending magnetic gradient and the Cottage Grove and Rough Creek Fault Systems. The western border is defined by the Centralia Fault and the Duquoin Monocline. The Southern Illinois - Wabash Zone is characterized by east-west horizontal compression. Fault plane solutions indicate reverse movement on a north-south zone of weakness (Herrmann, 1979; Street, et al, 1974). This zone is considered to be distinct from the New Madrid zone to the south (Sargent & Lundy, 1975).

Within the past 100 years, this zone has experienced 1.3 earthquakes per 1000 km^2. The maximum event is m_b = 5.8 (I_o = VIII). Two events have occurred between m_b = 5.5 and 5.7, and four events between m_b = 5.0 and 5.4. The least squares regression for the zone results in anomalous values for the slope and 1000-year event. The MCE determined for this zone is m_b = 6.5 (I_o = X-) and the OBE is m_b = 6.2 (I_o = IX+).

East Embayment

The region east of the New Madrid area is one of moderately high seismicity. Its northeast border is defined by the edge of the Mississippi Embayment Trough, Stearns' Bending Zone 1 (Union Electric, 1974), the Fluorspar Fault Complex, and the limit of Cenozoic faulting. The southeast border is marked by the edge of the Mississippi Embayment Trough as defined by Cretaceous stratigraphic contours. The west border is defined by the east Mississippi gravity and magnetic high, the east side of Stearns' Bending Zone 2, and Atherton's second Mississippi Valley Fault (Union Electric, 1974). Fault plane solutions indicate movement on a north-south zone of weakness (Street, et al, 1974).

This zone has experienced 2.0 earthquakes per 1000 km^2 corrected for a 100 year time frame. The maximum event of record is m_b = 5.7 (I_o = VII) and was the only event greater than m_b = 5.0. However, eleven events between m_b = 4.0 and 4.9 have occurred. The least squares regression for

the zone has a slope of -0.95 and a 1,000-year event of m_b = 6.2. The MCE determined for this zone is m_b = 6.2 (I_o = IX+) and the OBE is m_b = 5.8 (I_o = VIII+).

New Madrid

The New Madrid region is the major source of seismic activity in the central United States. It includes the intersection of the Pascola Arch and Mississippi Embayment, Cenozoic alkalic intrusives, active faults revealed by trenching (Russ, 1979), and active faults inferred from microearthquake trends (St. Louis University, 1980). Its northern boundary is defined by a change in earthquake density and the 3,000-foot stratigraphic contour on the northern flank of the Pascola Arch. To the east it is bounded by Atherton's second Mississippi Valley Fault and the east side of Stearns' Bending Zone 2. Its southeast border is defined by the east Mississippi gravity and magnetic highs. The northwest border is defined by the west Mississippi gravity and magnetic highs, Atherton's first Mississippi Valley Fault, and igneous plugs inferred from gravity and magnetic anomalies.

The stress regime in this region is complex with both tension and compression occurring south of latitude 36.3°, and east-west compression occurring to the north. Fault plane solutions exhibit normal, reverse, and strike-slip movement (Herrmann, 1979; Street, et al, 1974). The trends of the fault plane solutions strike northwest, northeast, and north-south indicating a complex generating mechanism. The focal depth for these, as well as all other central United States earthquakes, has been found to be within the upper 20 kilometers of the crust (Nuttli & Herrmann, 1978b).

This zone has experienced 14.3 earthquakes per 1000 km^2 within the last 100 years. The maximum event is estimated to be proportional to a m_b = 7.4 (I_o = XI-XII), the largest event of 1811-12 New Madrid Series (Nuttli, 1973c). The equivalent energy output of the New Madrid Series is estimated to be a single earthquake of m_b = 7 1/2. A m_b = 6.0 event occurred in 1843 and a m_b = 6.2 event occurred in 1895. A total of six events have occurred between m_b = 5.0 and 5.4 during the last 160 years. The least squares regression for the zone has a slope of -0.76 and a 1,000-year event of m_b = 7.8. The MCE determined for this zone is scaled to m_b = 7.5 (I_o = XI-XII). Although body-wave magnitude may not instrumentally reach this value, far field motion and other magnitude values will be proportional to m_b = 7.5. The chosen OBE is m_b = 6.9 (I_o = X+).

West Embayment

The region west of the New Madrid area is one of moderate seismicity. It is bounded on the north by the edge of the Mississippi Embayment Trough, and on the northwest by both Stearns' Bending Zone 3 and the western edge of northwest trending lineaments. Its southeast border is defined by the west Mississippi gravity and magnetic highs, Atherton's first Mississippi Valley Fault, and igneous plugs inferred from gravity and magnetic anomalies.

The stress regime in this region is complex with the occurrence of both tension and compression. Fault plane solutions indicate normal, reverse, and strike-slip movement (Herrmann, 1979; Street, et al, 1974).

The West Embayment Zone has experienced 5.2 earthquakes per 1000 km^2 adjusted for a span of 100 years. The maximum known event is $m_b = 4.7$ (I_o = VI) with three other events occurring between $m_b = 4.5$ and 4.7. The least squares regression for the West Embayment has a slope of -0.93 and a 1,000-year event of $m_b = 6.4$. The MCE determined for the West Embayment Zone is $m_b = 6.1$ (I_o = IX) and the OBE is $m_b = 5.8$ (I_o = VIII+).

Ozark Random

This is a region of moderate seismicity. It contains the Palmer and Simms Mountain Fault Systems, the Black and Ellington Faults, and the entire Ste. Genevieve - Rattlesnake Ferry Fault System. It also encompasses the structurally highest part of the Ozark Dome and all areas of exposed Precambrian rock. The northern boundary is defined by the Cottage Grove Fault System, a change in earthquake epicenter density, a difference in orientation of the regional structural trend, and a change in fault movement from normal to reverse along the northern slope of the Ozark Uplift. The eastern border is defined by the edge of the Fluorspar Fault Complex, and the southeast border by both Stearns' Bending Zone 3 and the western edge of a zone of northwest trending lineaments. The western border is based on the contrast of earthquake densities and the end of faulting marginal to the St. Francois Mountains.

The stress regime, distinct from the surrounding areas, is characterized by north-south tension. Fault plane solutions indicate normal movement on a northwest zone of weakness (Herrmann, 1979; Street, et al, 1974). Consideration was given to dividing this zone into northern and southern portions; however, due to their similar seismicity, tectonic history and geology, they were considered as one zone.

The Ozark Zone has experienced 3.4 earthquakes per 1000 km^2 per 100 years of corrected record. The maximum known event is $m_b = 5.0$ (I_o = VI) with five other events occurring between $m_b = 4.5$ and 4.9. The least squares regression for the zone has a slope of -0.98 and a 1,000-year earthquake of $m_b = 6.2$. The MCE determined for this zone is $m_b = 6.0$ (I_o = IX-), and the OBE is $m_b = 5.6$ (I_o = VIII).

Nemaha

This north-south trending zone in eastern Kansas is associated with a linear zone of moderate seismic activity. This zone also contains two Cenozoic alkalic extrusives. The western border is defined by the western edge of the Midcontinent Gravity and Magnetic High (MCGMH). The eastern border is defined by the eastern edge of the MCGMH and the Nemaha Uplift - Humbolt Fault System. The northern edge of this zone is based on the change to a northeast orientation of the MCGMH at its intersection with the Thurman - Wilson Fault. The southern border is indefinite and, although it may

extend as far as the Wichita Uplift, was defined as the southern limit of the north-south linear trend of higher seismicity.

During the last 100 year period, this zone has experienced 0.4 earthquakes per 1000 km^2. The maximum event of record is m_b = 5.5 (I_o = VIII) with two other events occurring between m_b = 5.0 and 5.4. The paucity of historic earthquakes in this zone produced anomalous earthquake recurrence statistics which were not further evaluated. The MCE determined for the Nemaha Zone is m_b = 6.1 (I_o = IX); the OBE is m_b = 5.8 (I_o = VIII+) which is equivalent to the 500-year event.

Central US Random

This zone includes all the central United States within the study area not lying within one of the previously described zones. It is characterized by horizontal compressive stress and low, random seismicity. This zone contains such structural features as the Mississippi River Arch, the Lincoln Fold, the Cap au Gres faulted flexure, the shelf portions of the Illinois Basin, the Sangamon Arch, the La Salle anticlinal belt, the Moorman Syncline, and the Western Kentucky and Flourspar Fault Complexes. Consideration was given to subdividing this area into smaller zones using some of these features as boundaries. This subdivision did not create uniquely different zones. The low earthquake density, the random seismicity within the zone, and the lack of association between seismicity and geologic structure indicate that the area should be considered as one large zone.

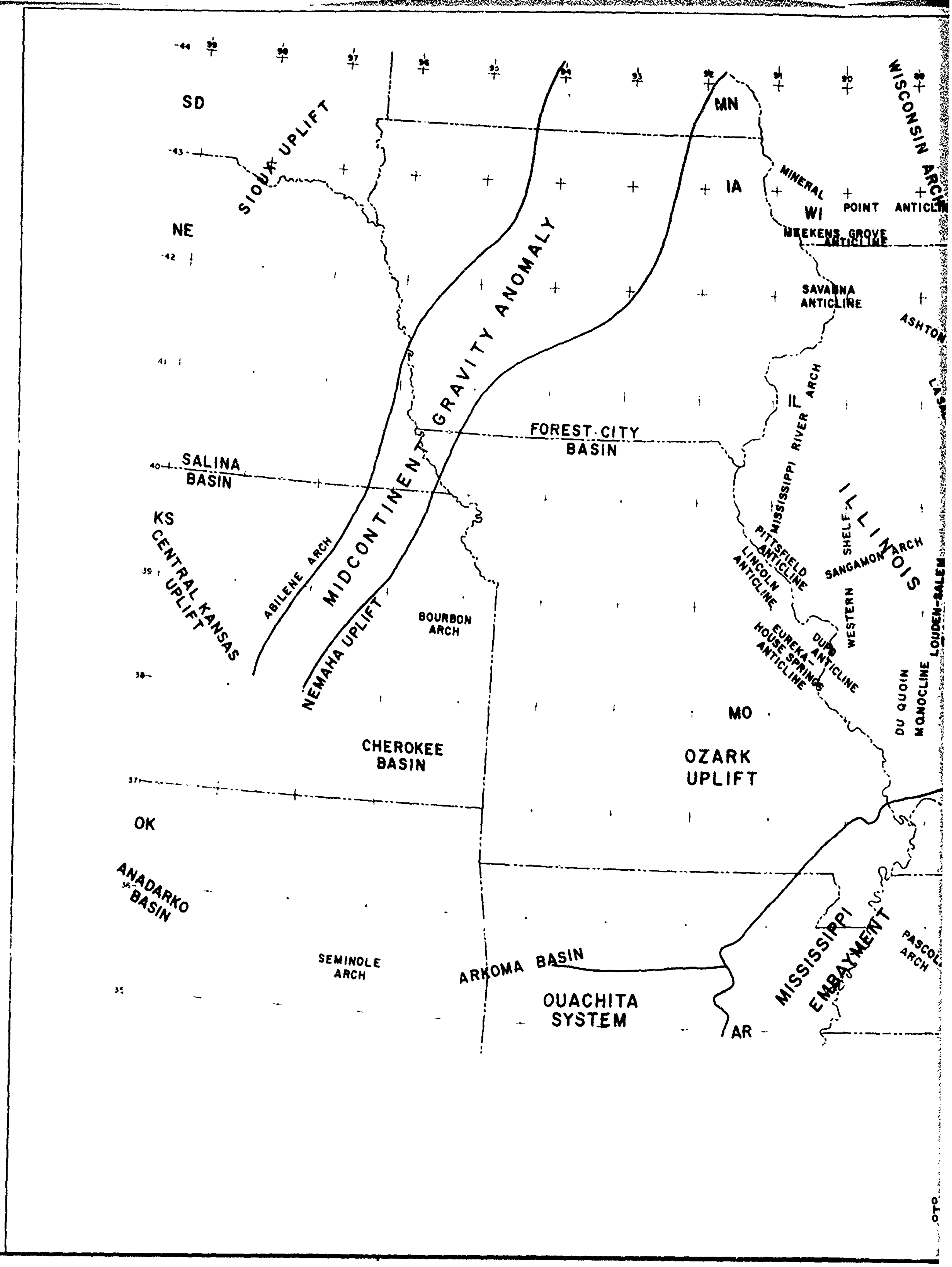
This zone has experienced 0.1 earthquakes per 1000 km^2 in the previous 100 years. The maximum known earthquakes are two, widely distant m_b = 5.3 (I_o = VII) earthquakes with thirteen events occurring between m_b = 4.5 and 4.9. The least squares regression for the zone has a slope of -1.15 and a 1000-year event of m_b = 5.6, when its area of 544,000 km^2 was normalized to 100,000 km^2. The MCE determined for this zone is m_b = 5.6 (I_o = VIII) and the OBE is m_b = 5.3 (I_o = VII-VIII).

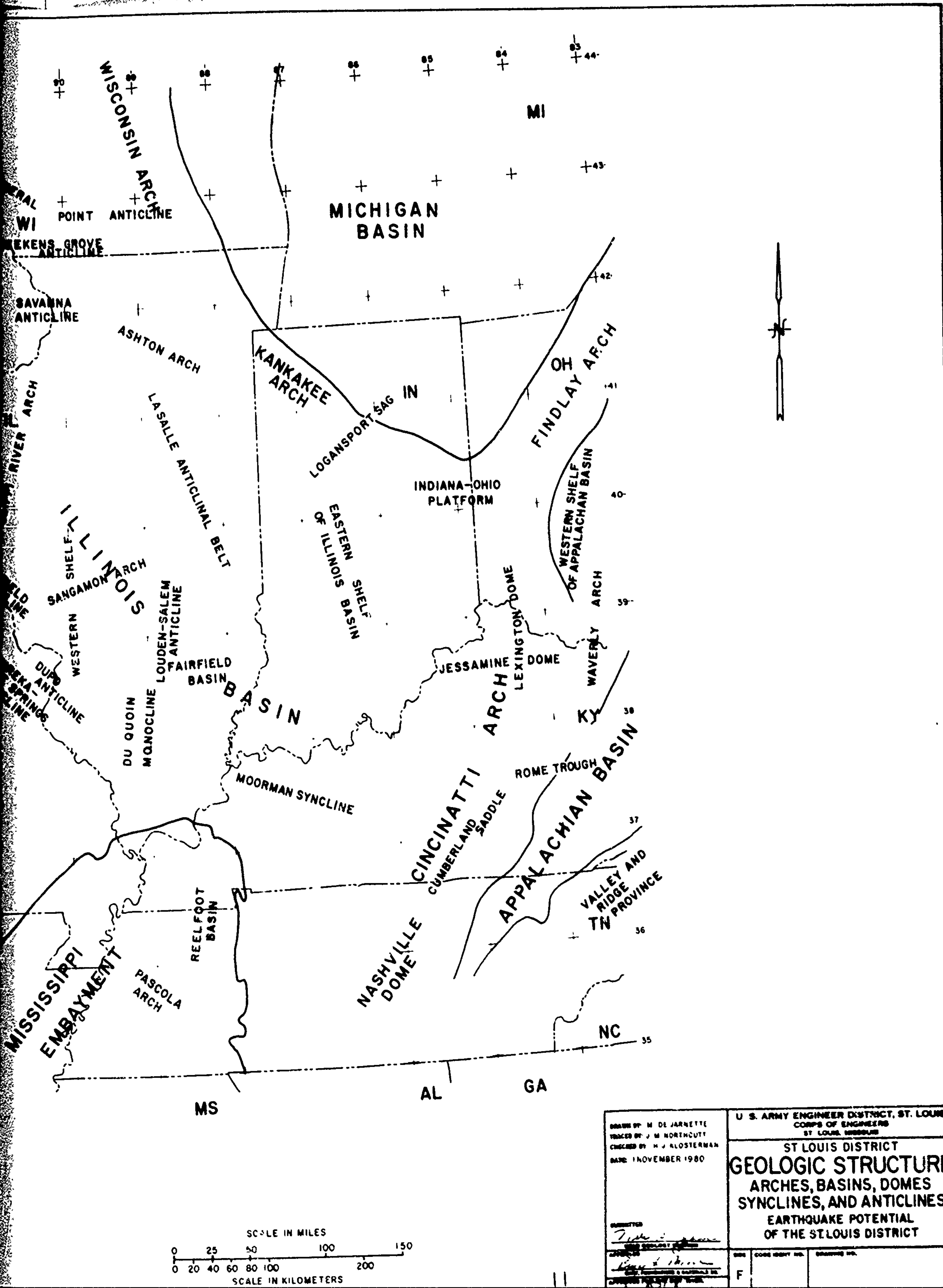
TABLE OF DESIGN EARTHQUAKES FOR THE SEISMOTECTONIC ZONES

Zone	MCE		OBE	
	m_b	I_o	m_b	I_o
Anna, Ohio	6.4	IX-X	6.1	IX
Southern Illinois - Wabash	6.5	X-	6.2	IX+
East Embayment	6.2	IX+	5.8	VIII+
New Madrid	7.5	XI-XII	6.9	X+
West Embayment	6.1	IX	5.8	VIII+
Ozark Random	6.0	IX-	5.6	VIII
Nemaha	6.1	IX	5.8	VIII+
Central US Random	5.6	VIII	5.3	VII-VIII

CONCLUSIONS

The boundaries and design earthquakes of eight seismotectonic zones have been determined for the central United States. The design earthquakes for each of the zones are tabulated above. The seismotectonic zones and design earthquakes will be used to assess ground shaking at the projects of the St. Louis District, Corps of Engineers. Ground motions at St. Louis District projects resolved from suggested design earthquakes should be expected to exceed previous Corps of Engineers design criteria. The current state-of-the-art of earthquake engineering does suggest, however, that these higher levels of shaking will occur.


SD
SIOUX UPLIFT
NE
MN
IA
WI
MINERAL POINT ANTICLINE
WISCONSIN ARCH
MEEKENS GROVE ANTICLINE
SAVANNA ANTICLINE
ASHTON
MIDCONTINENT GRAVITY ANOMALY
IL
MISSISSIPPI RIVER ARCH
FOREST CITY BASIN
SALINA BASIN
KS
CENTRAL KANSAS UPLIFT
ABILENE ARCH
NEMAHA UPLIFT
BOURBON ARCH
PITTSFIELD ANTICLINE
LINCOLN ANTICLINE
WESTERN ILLINOIS SHELF
SANGAMON ARCH
LOUDEN-SALEM
DUPO ANTICLINE
EUREKA-HOUSE SPRINGS ANTICLINE
DU QUOIN MONOCLINE
MO
CHEROKEE BASIN
OZARK UPLIFT
OK
ANADARKO BASIN
SEMINOLE ARCH
ARKOMA BASIN
OUACHITA SYSTEM
AR
MISSISSIPPI EMBAYMENT
PASCOLA ARCH

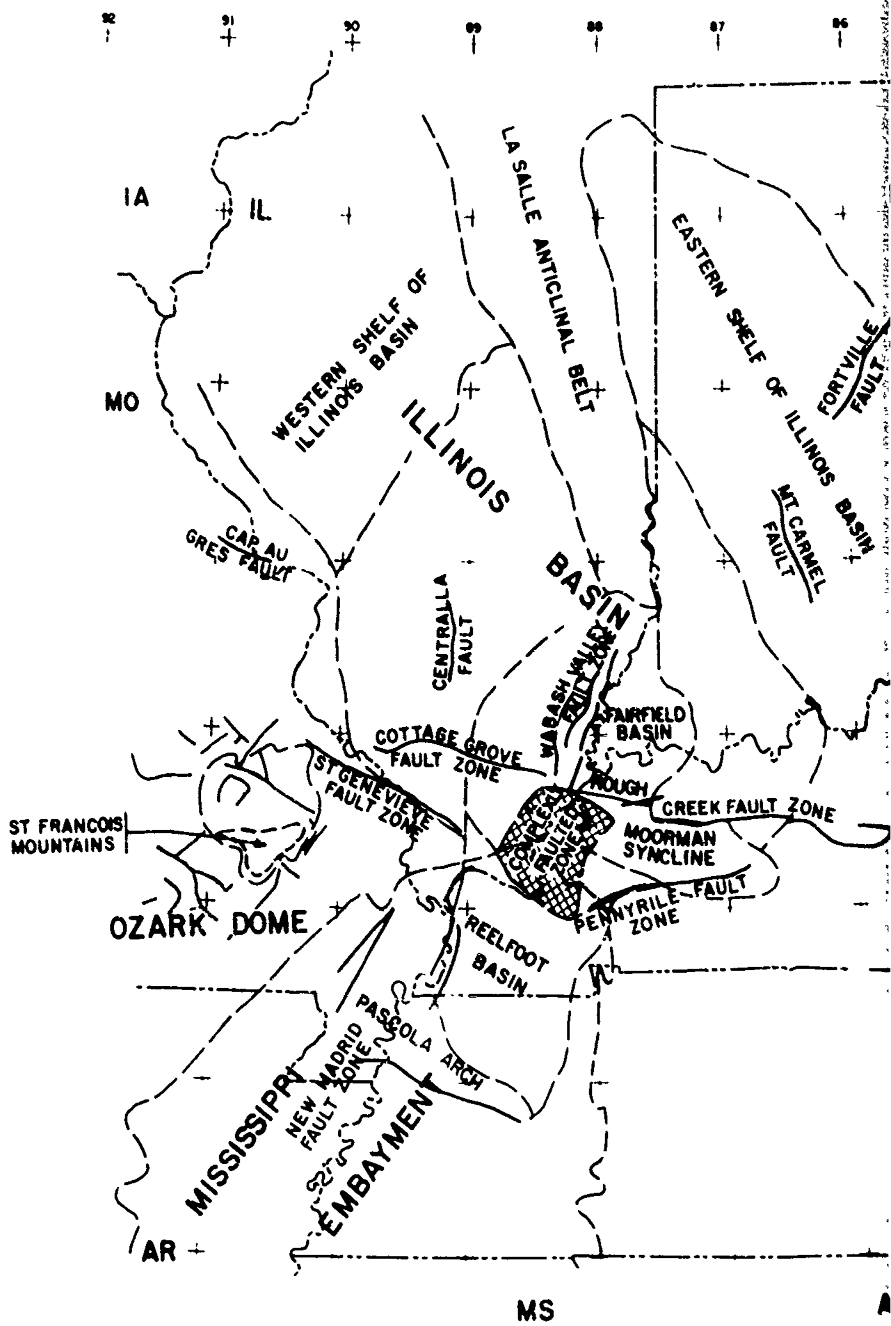


DRAWN BY: M. DE JARNETTE
TRACED BY: J. M. NORTHCUTT
CHECKED BY: H. J. KLOSTERMAN
DATE: 1 NOVEMBER 1980

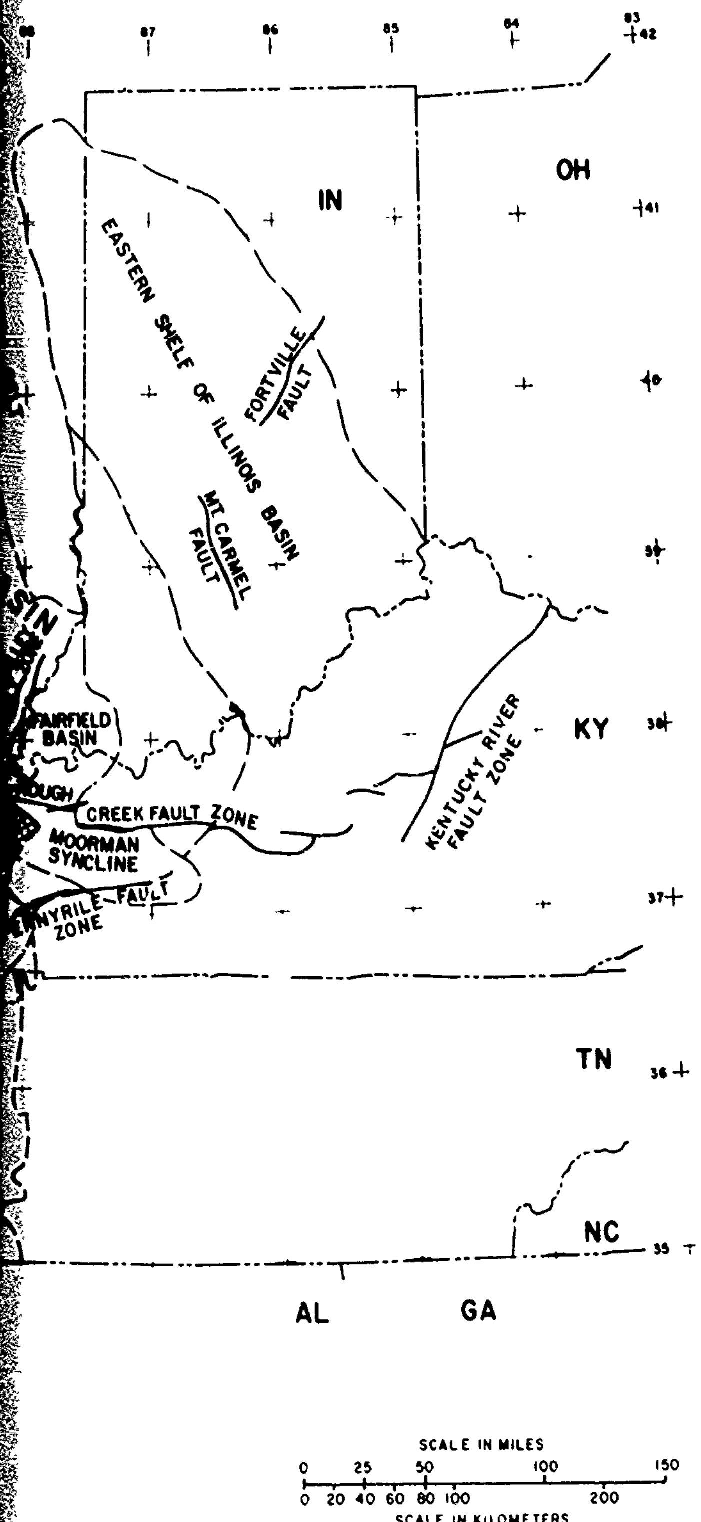
U. S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

ST LOUIS DISTRICT
GEOLOGIC STRUCTURE
ARCHES, BASINS, DOMES
SYNCLINES, AND ANTICLINES
EARTHQUAKE POTENTIAL
OF THE ST.LOUIS DISTRICT

F



IA
IL
MO
WESTERN SHELF OF ILLINOIS BASIN
ILLINOIS
BASIN
LA SALLE ANTICLINAL BELT
EASTERN SHELF OF ILLINOIS BASIN
FORTVILLE FAULT
MT. CARMEL FAULT
CAP AU GRES FAULT
CENTRALIA FAULT
WABASH VALLEY FAULT ZONE
FAIRFIELD BASIN
COTTAGE GROVE FAULT ZONE
ST GENEVIEVE FAULT ZONE
TROUGH
CREEK FAULT ZONE
ST FRANCOIS MOUNTAINS
COMPLEXLY FAULTED ZONE
MOORMAN SYNCLINE
PENNYRILE FAULT ZONE
OZARK DOME
REELFOOT BASIN
PASCOLA ARCH
NEW MADRID FAULT ZONE
MISSISSIPPI EMBAYMENT
AR
MS

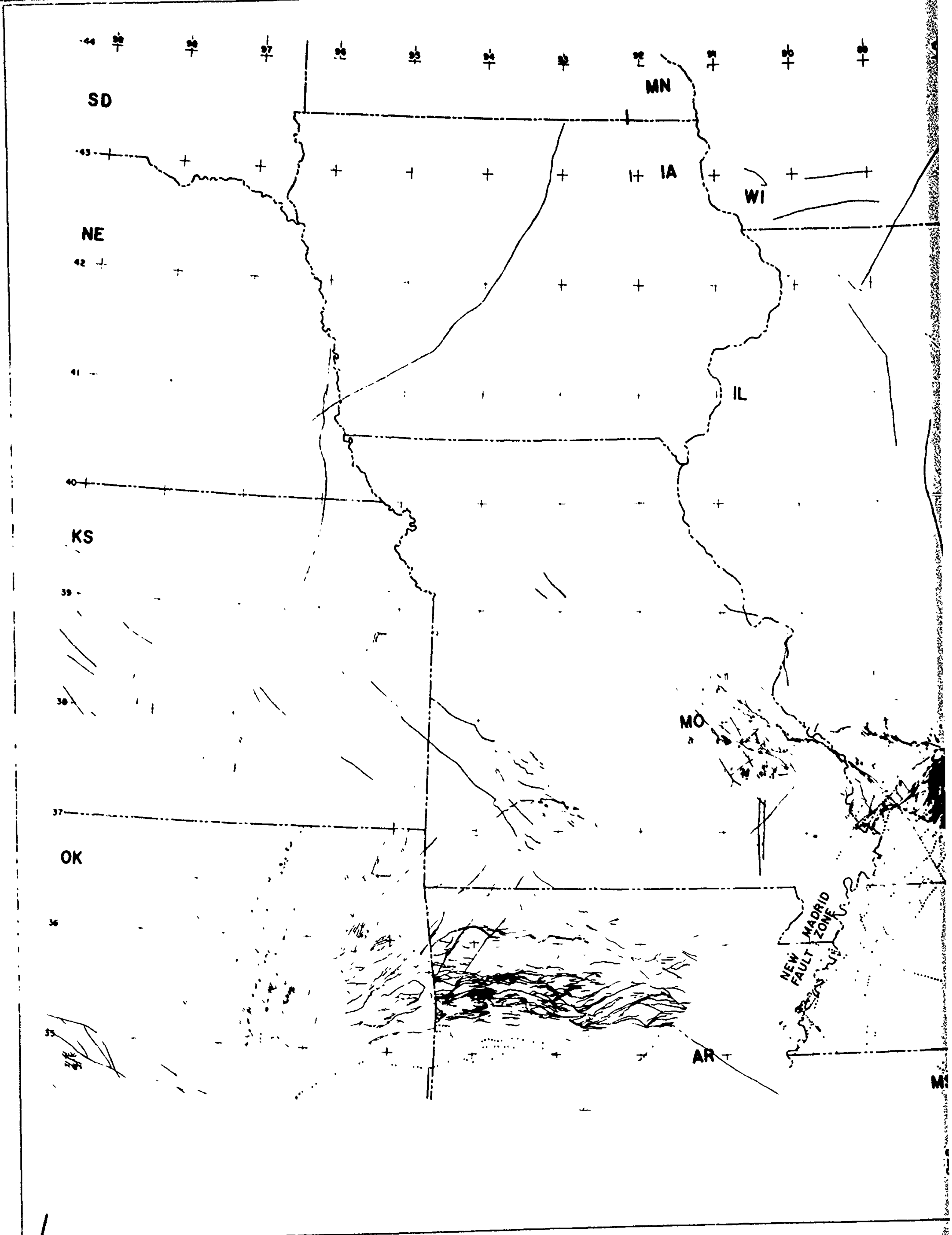


LEGEND

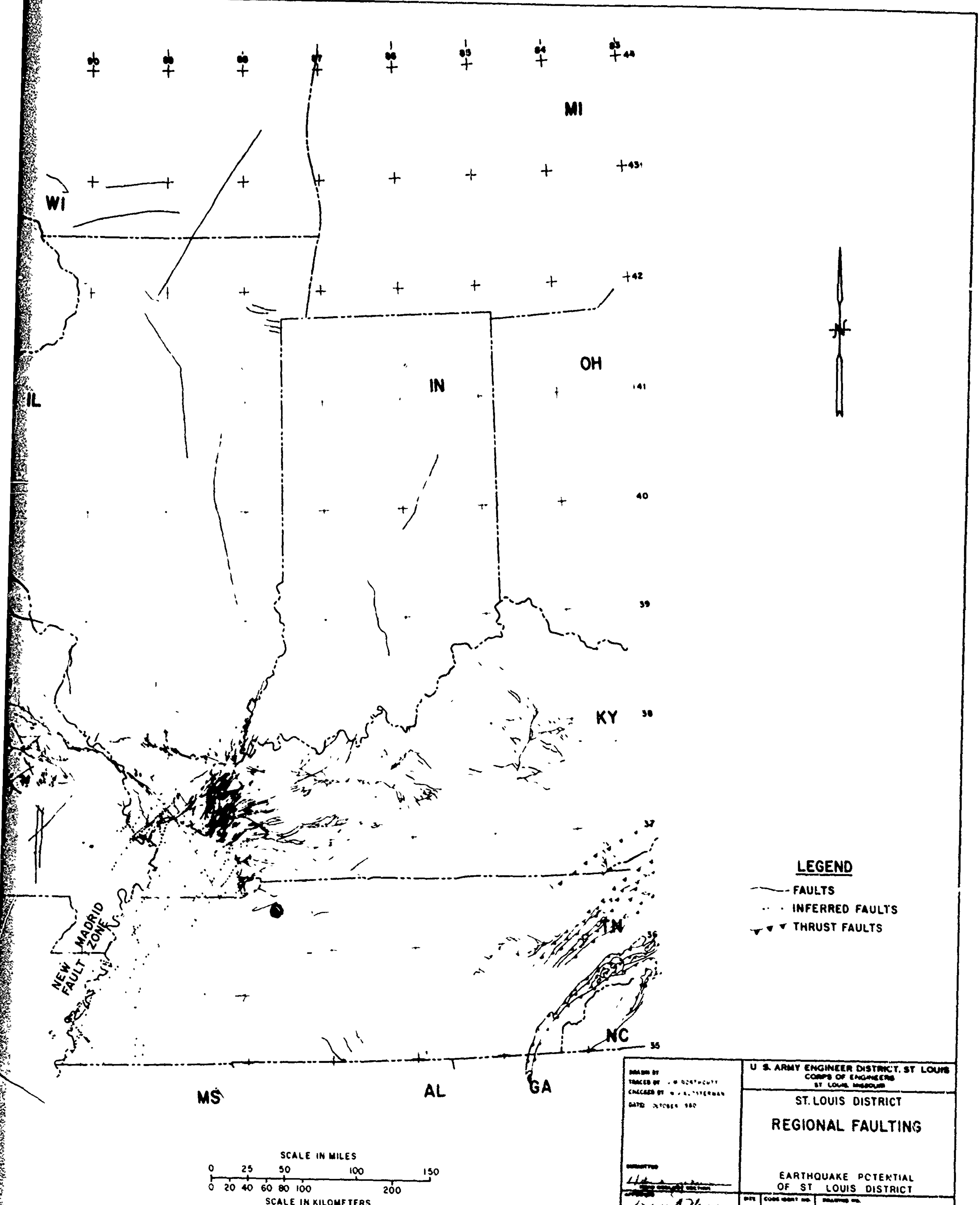
STRUCTURAL BOUNDARIES

FAULTS

	U S ARMY ENGINEER DISTRICT ST LOUIS CORPS OF ENGINEERS ST LOUIS MISSOURI
	ST LOUIS DISTRICT TECTONIC FEATURES ON BASEMENT EARTHQUAKE POTENTIAL OF ST LOUIS DISTRICT
SUBMITTED HEAD GEOLOGY SECTION	F
APPROVED	SCALE AS SHOWN
APPROVED FOR THE DIST ENGR CHIEF ENGINEERING DIVISION	SHEET 2 OF 13



SD
MN
IA
WI
NE
IL
KS
MO
OK
AR
NEW FAULT
MADRID ZONE
44
43
42
41
40
39
38
37
36
35



U S. ARMY ENGINEER DISTRICT, ST LOUIS
CORPS OF ENGINEERS
ST LOUIS, MISSOURI

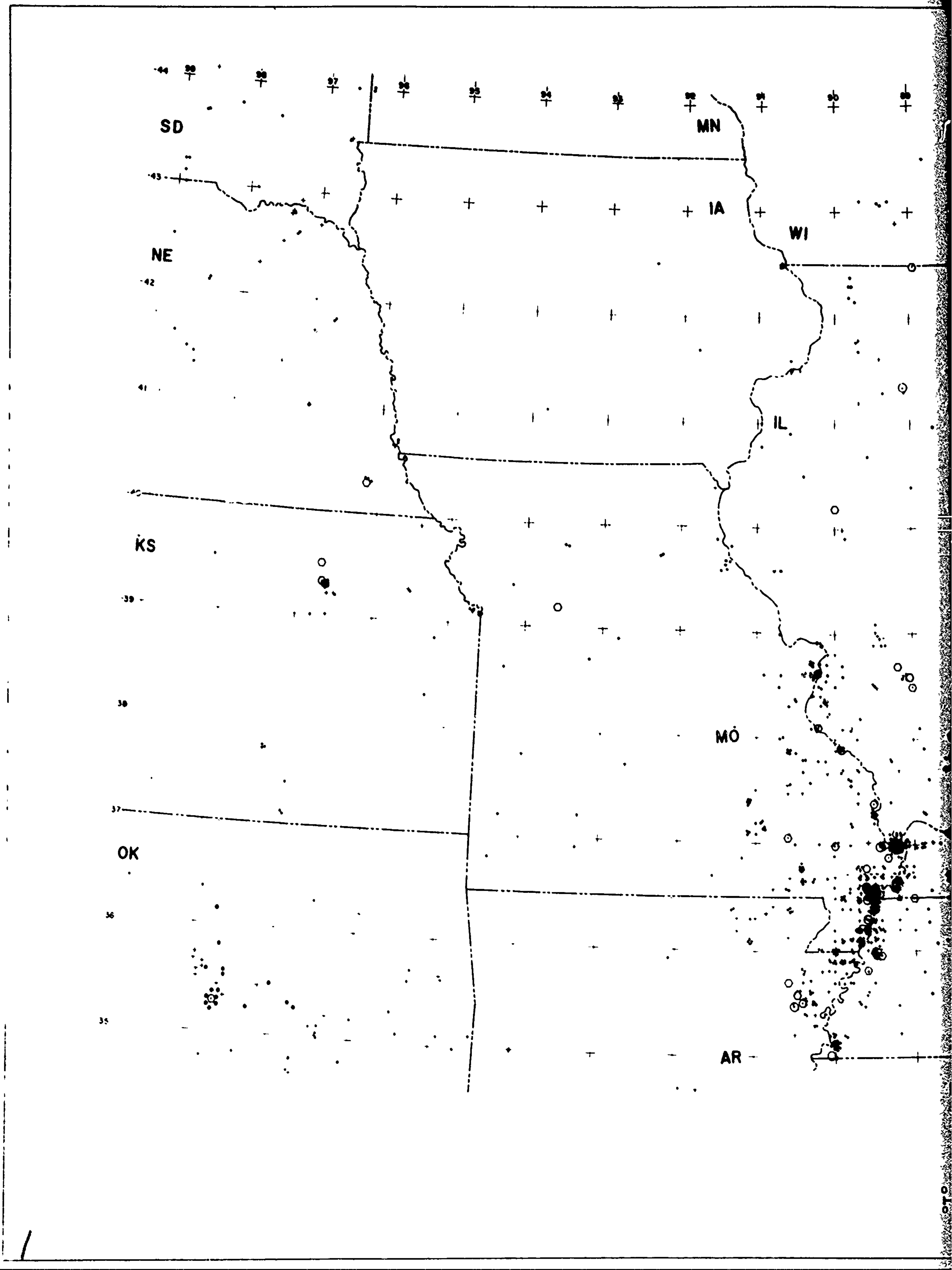
ST. LOUIS DISTRICT

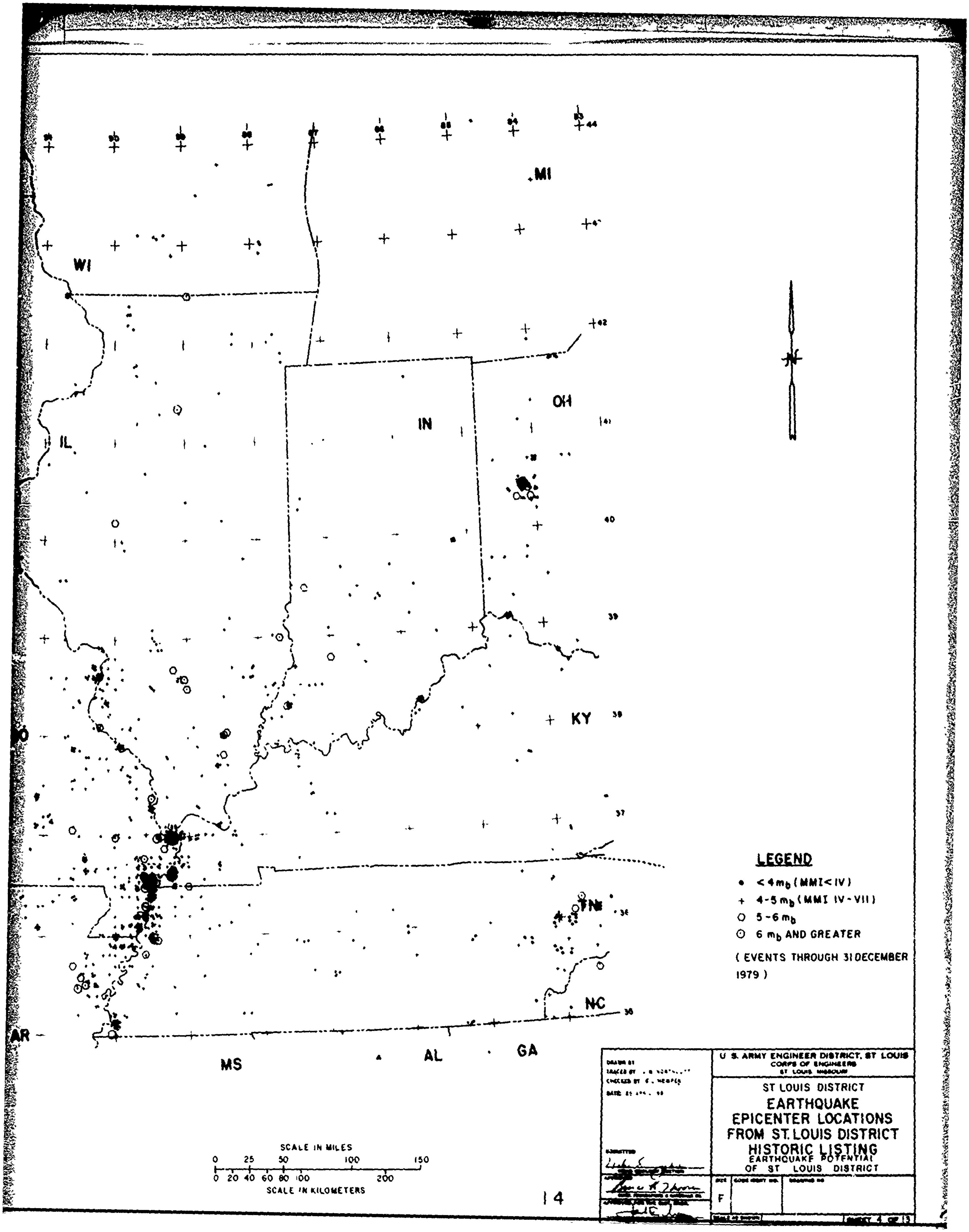
REGIONAL FAULTING

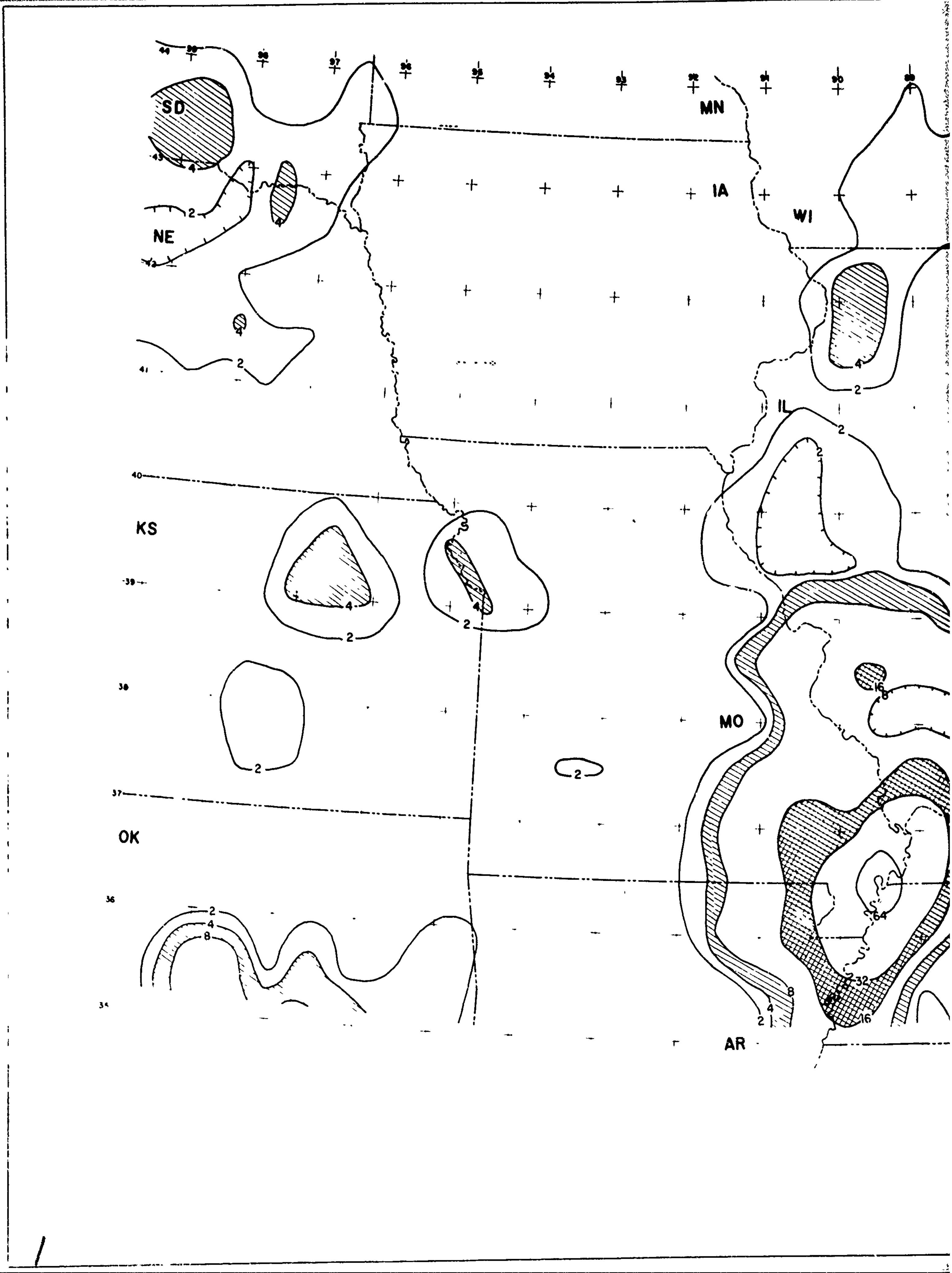
EARTHQUAKE POTENTIAL
OF ST LOUIS DISTRICT

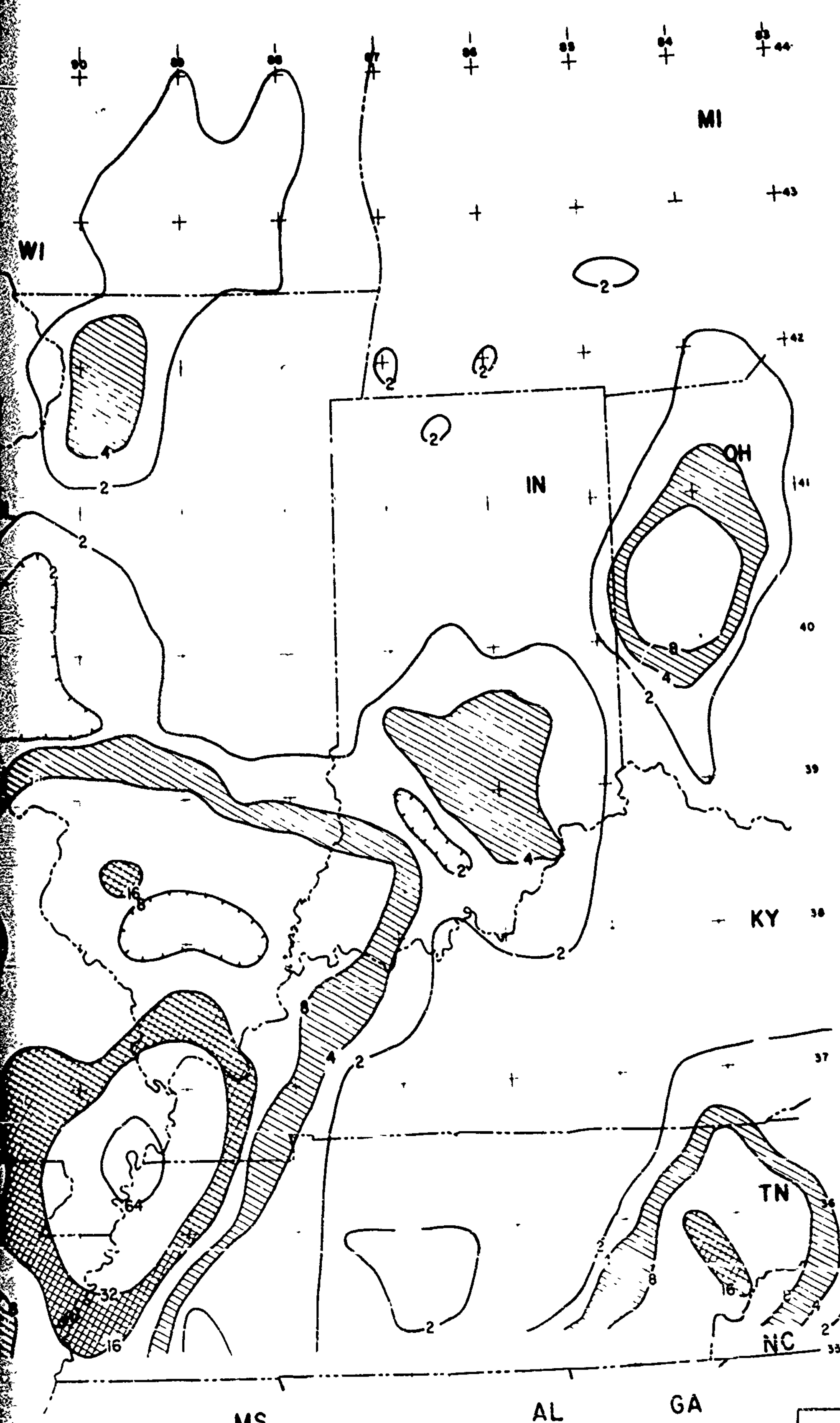
F

SHEET 3 OF 13


SD
MN
IA
WI
NE
IL
KS
MO
OK
AR


MI
WI
IL
IN
OH
KY
MO
TN
NC
AR
MS
AL
GA
N
LEGEND
• < 4 m_b (MMI< IV)
+ 4-5 m_b (MMI IV-VII)
○ 5-6 m_b
⊙ 6 m_b AND GREATER
(EVENTS THROUGH 31 DECEMBER 1979)
SCALE IN MILES
0 25 50 100 150
0 20 40 60 80 100 200
SCALE IN KILOMETERS
U. S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI
ST LOUIS DISTRICT
EARTHQUAKE
EPICENTER LOCATIONS
FROM ST. LOUIS DISTRICT
HISTORIC LISTING
EARTHQUAKE POTENTIAL
OF ST LOUIS DISTRICT
F
SHEET 4 OF 13


SD
MN
IA
WI
NE
IL
KS
MO
OK
AR



LEGEND

CONTOURS SHOW THE DENSITY OF M_b 3 5 TO 4 4 EVENTS (1879 THROUGH 1979) Per 10,000 Sq Km

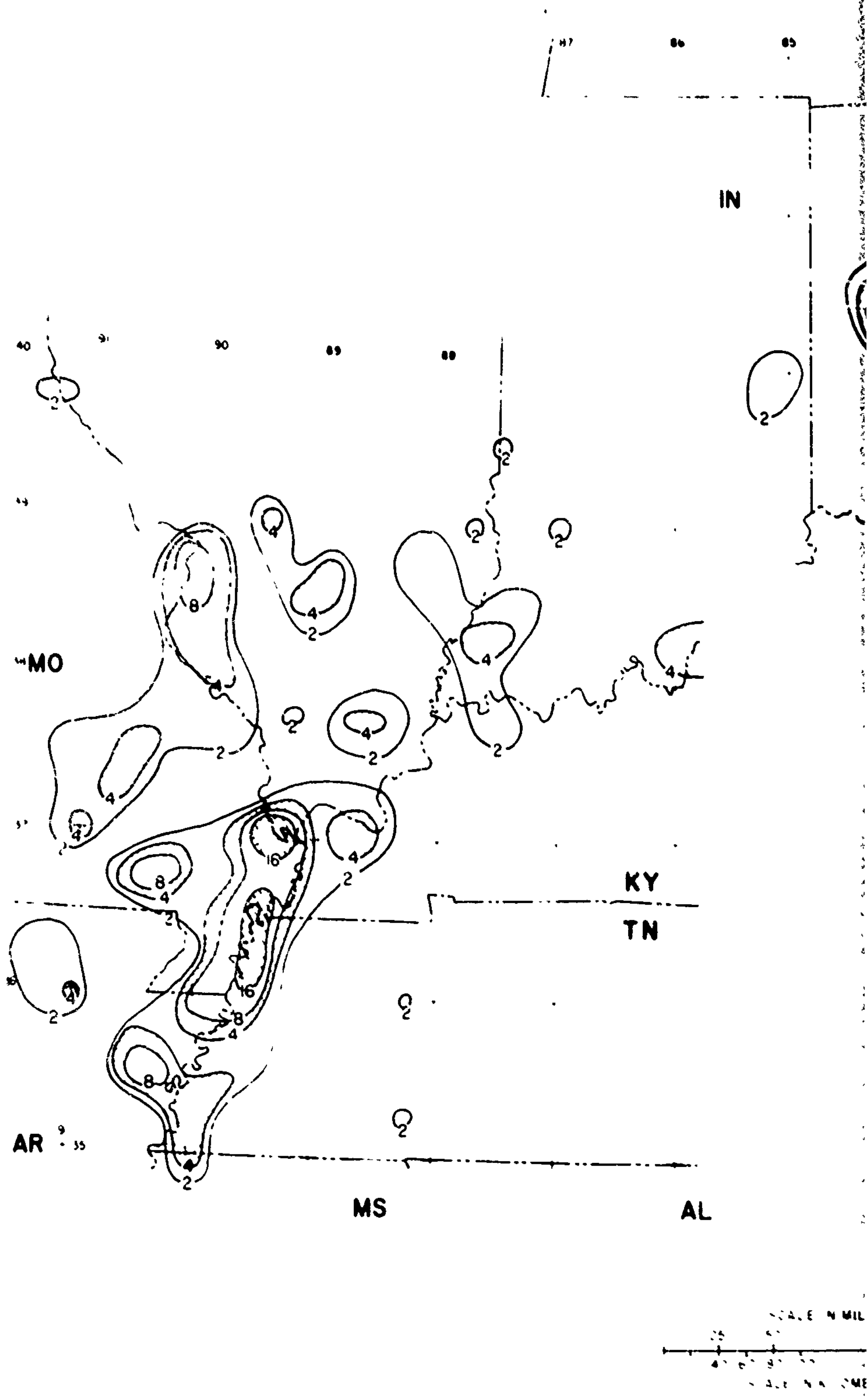
SCALE IN MILES
0 25 50 100 150
0 20 40 60 80 100 200
SCALE IN KILOMETERS

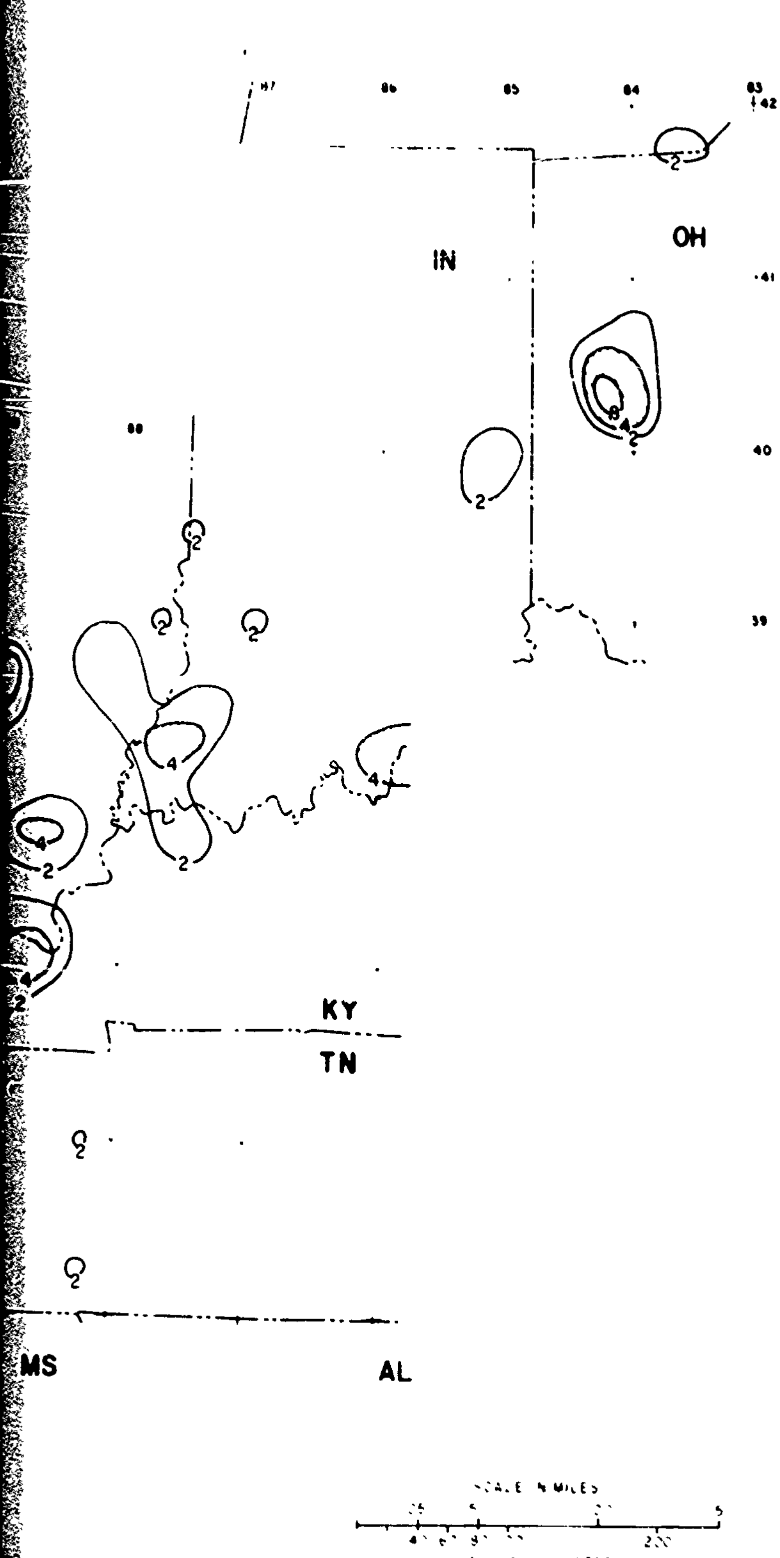
U S ARMY ENGINEER DISTRICT, ST LOUIS
CORPS OF ENGINEERS
ST LOUIS MISSOURI

ST LOUIS DISTRICT
CONTOURS
OF EARTHQUAKES
Per 10,000 Sq Km.
EARTHQUAKE POTENTIAL
OF ST LOUIS DISTRICT

SIZE F

SHEET 5 OF 13


IN
MO
KY
TN
AR
MS
AL



LEGEND

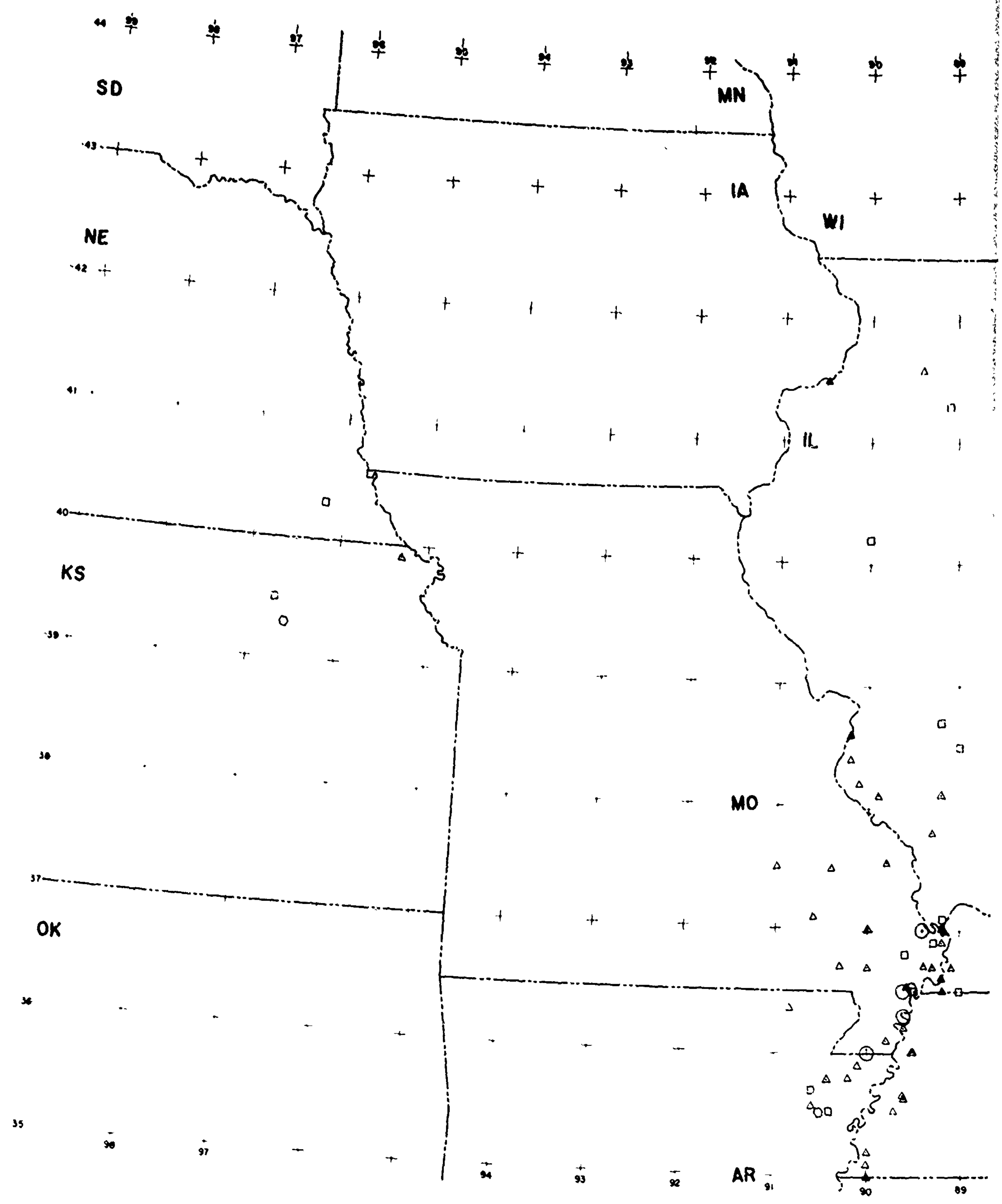
CONTOURS SHOW THE
DENSITY OF $M_b > 3.4$
EVENTS (1879 THROUGH 1979)
Per 1,000 Sq Km

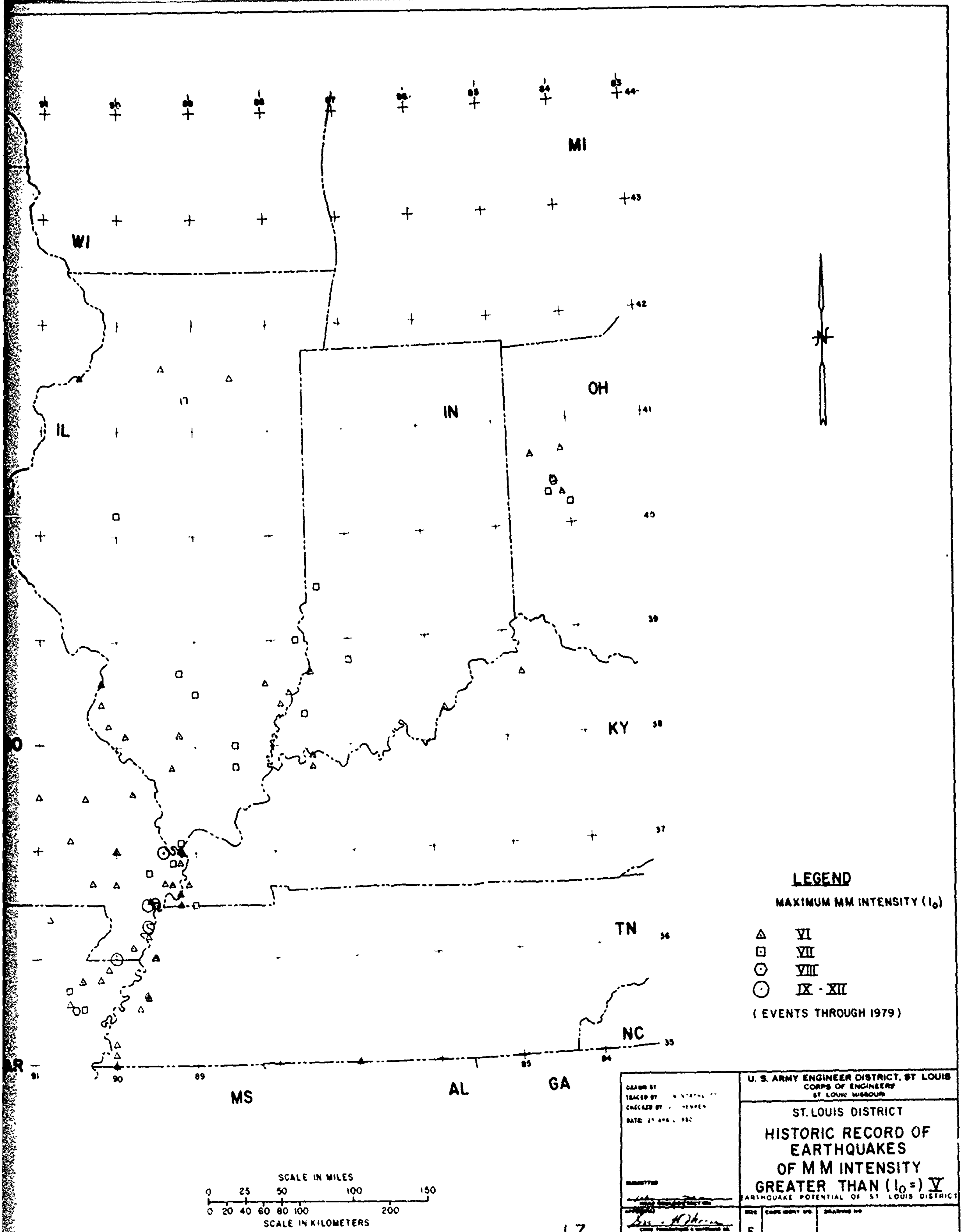
U S ARMY ENGINEER DISTRICT ST LOUIS
CORPS OF ENGINEERS
ST LOUIS MISSOURI

ST LOUIS DISTRICT
CONTOURS
OF EARTHQUAKES
Per 1,000 Sq. Km.

F

SHEET 5 OF 13


SD
MN
IA
WI
NE
IL
KS
MO
OK
AR
43
42
41
40
39
38
37
36
35
98
97
94
93
92
91
90
89



U. S. ARMY ENGINEER DISTRICT, ST LOUIS
CORPS OF ENGINEERS
ST LOUIS MISSOURI

DRAWN BY
TRACED BY
CHECKED BY
DATE

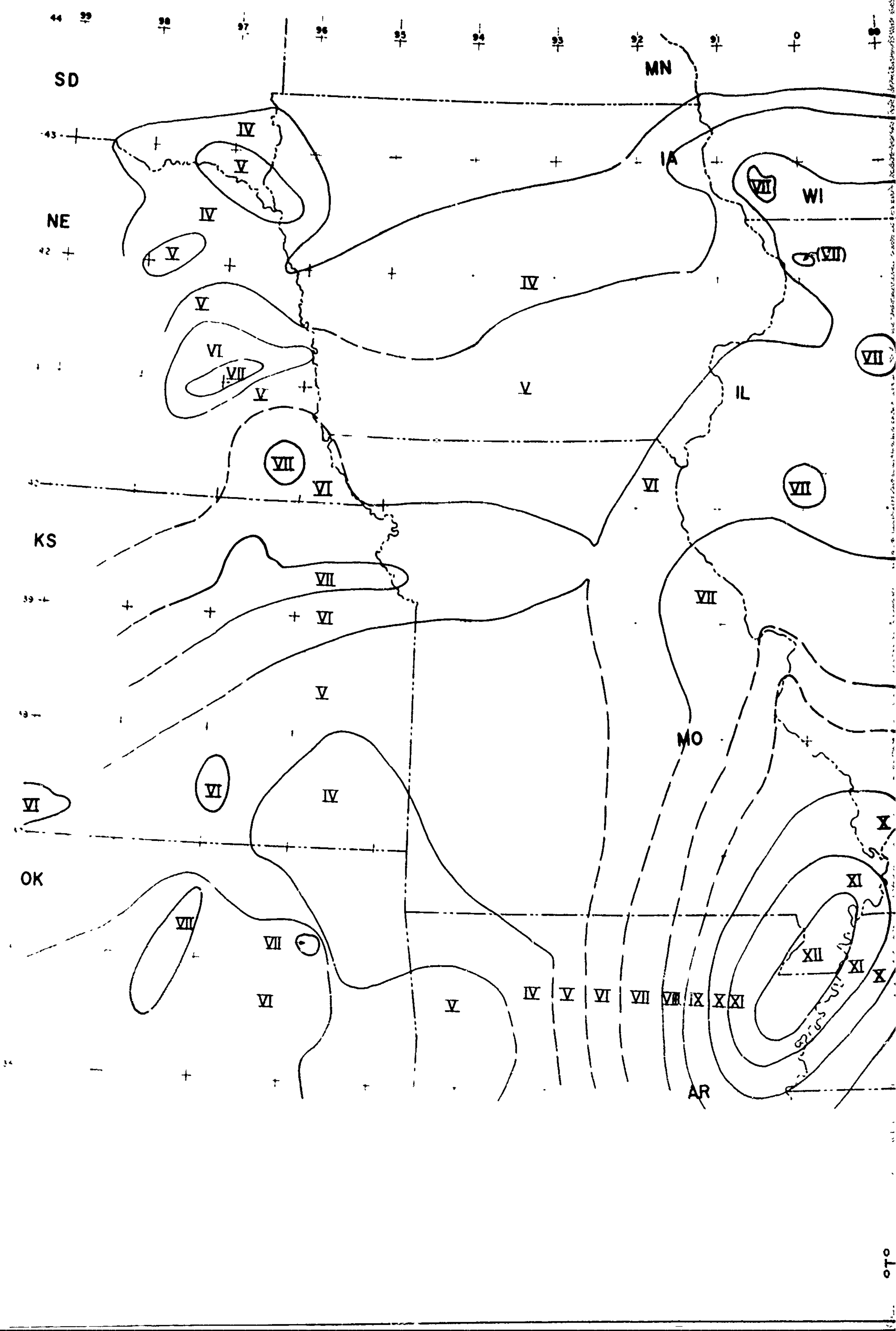
ST. LOUIS DISTRICT

HISTORIC RECORD OF EARTHQUAKES OF M M INTENSITY GREATER THAN (I_0 =) V

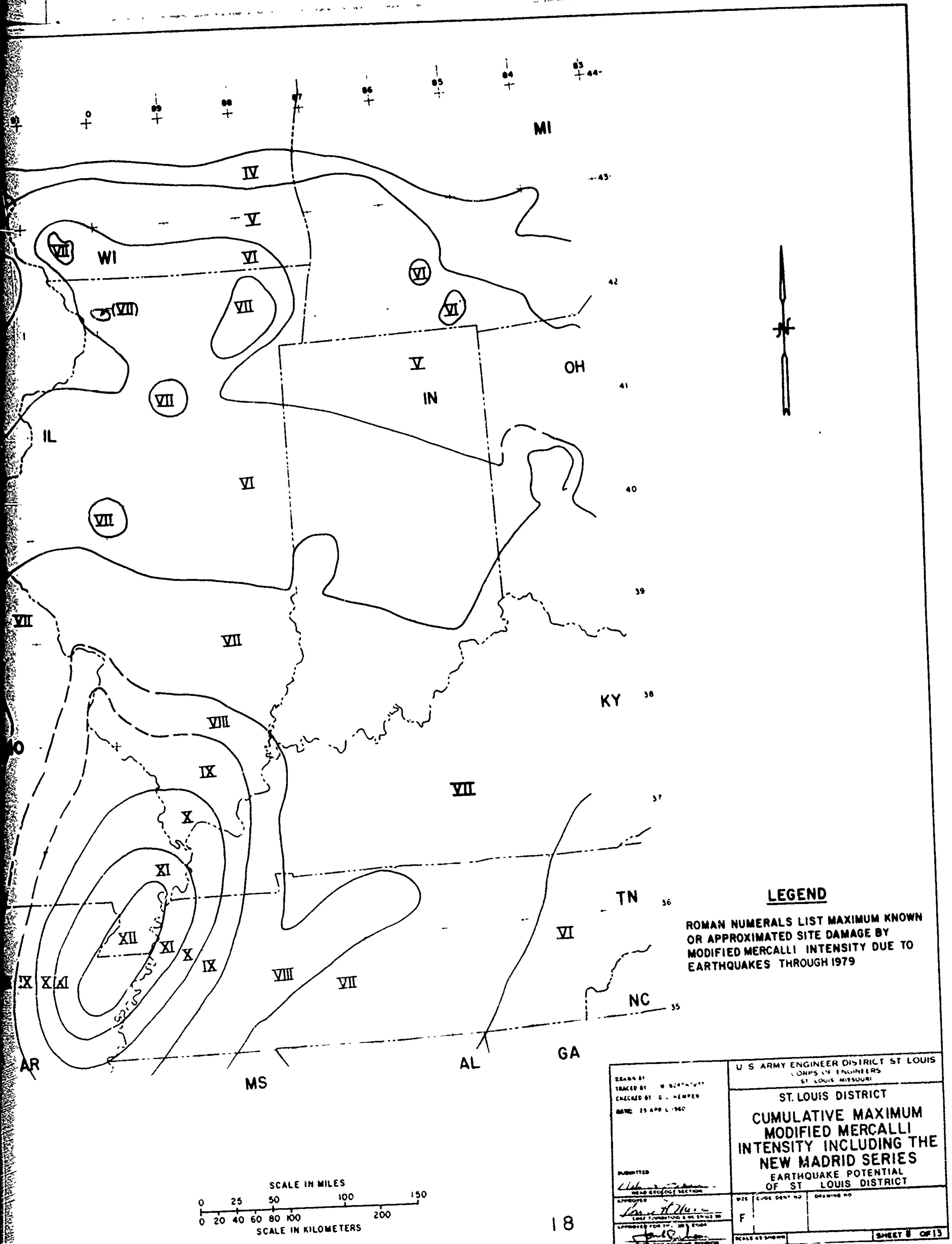
EARTHQUAKE POTENTIAL OF ST LOUIS DISTRICT

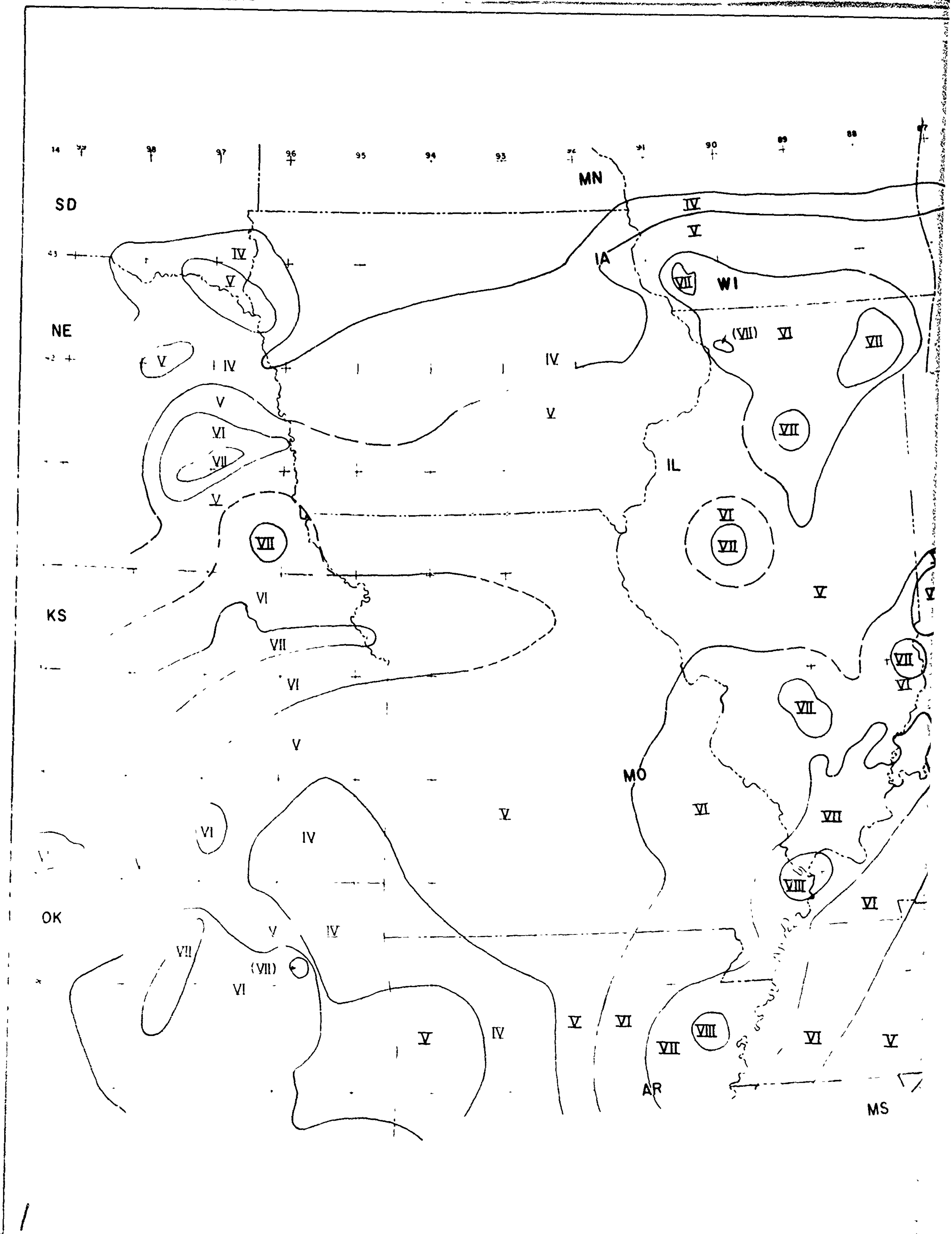
SUBMITTED
APPROVED
SIZE F
SCALE AS SHOWN
SHEET 7 OF 13

2

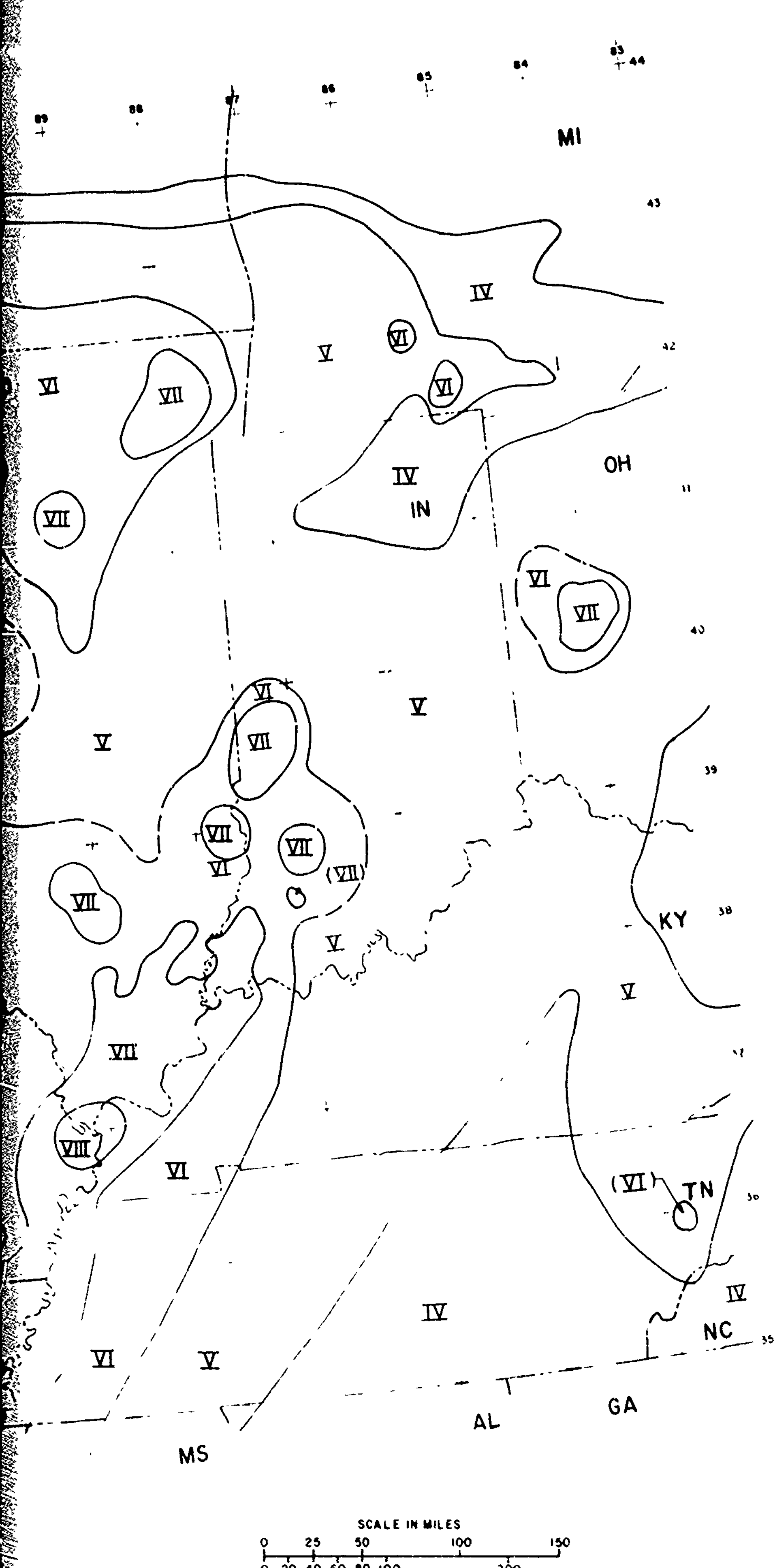


SD
MN
IA
WI
NE
IL
KS
MO
OK
AR
IV
V
VI
VII
VIII
IX
X
XI
XII


MI
WI
IL
IN
OH
KY
TN
NC
AR
MS
AL
GA
IV
V
VI
VII
VIII
IX
X
XI
XII
LEGEND
ROMAN NUMERALS LIST MAXIMUM KNOWN OR APPROXIMATED SITE DAMAGE BY MODIFIED MERCALLI INTENSITY DUE TO EARTHQUAKES THROUGH 1979
SCALE IN MILES
0 25 50 100 150
0 20 40 60 80 100 200
SCALE IN KILOMETERS
U S ARMY ENGINEER DISTRICT ST LOUIS
CORPS OF ENGINEERS
ST LOUIS MISSOURI
ST. LOUIS DISTRICT
CUMULATIVE MAXIMUM MODIFIED MERCALLI INTENSITY INCLUDING THE NEW MADRID SERIES
EARTHQUAKE POTENTIAL OF ST LOUIS DISTRICT



98
97
96
95
94
93
90
89
88
MN
SD
NE
IA
WI
IL
KS
MO
OK
AR
MS
IV
V
VI
VII
(VII)
VIII



LEGEND

ROMAN NUMERALS LIST MAXIMUM KNOWN OR APPROXIMATED SITE DAMAGE BY MODIFIED MERCALLI INTENSITY DUE TO EARTHQUAKES THROUGH 1979

U S ARMY ENGINEER DISTRICT ST LOUIS

ST LOUIS DISTRICT

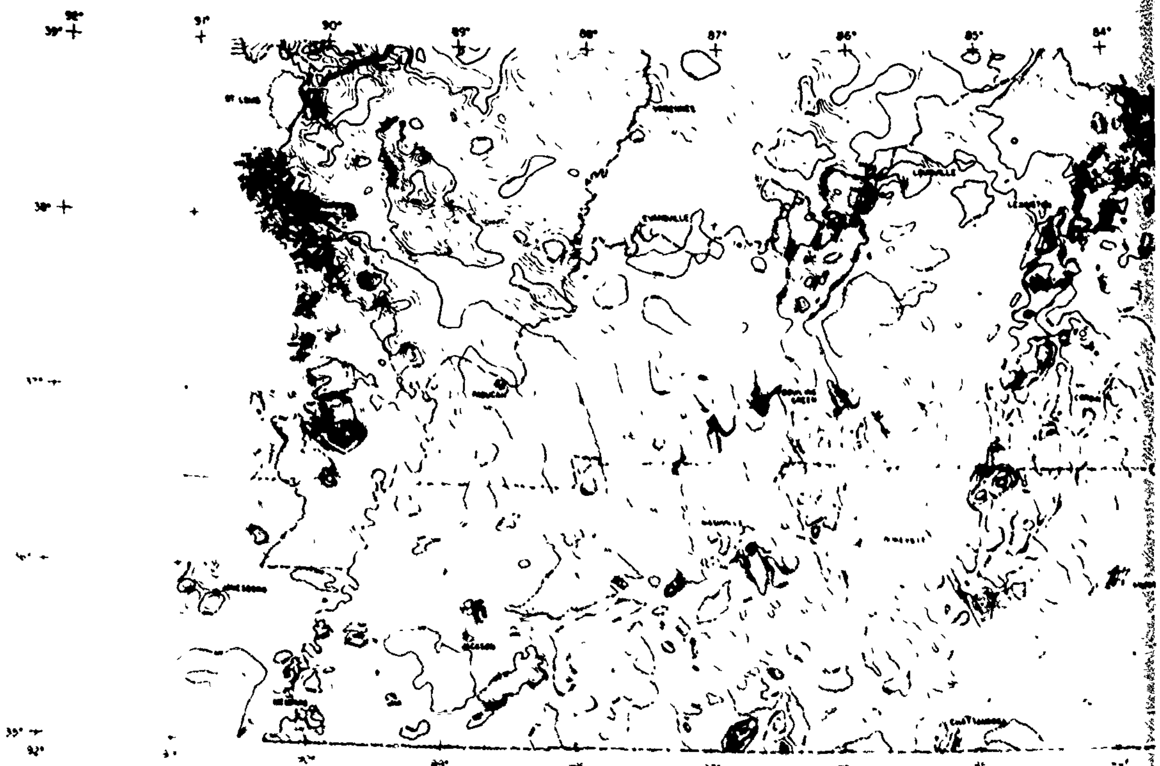
CUMULATIVE MAXIMUM MODIFIED MERCALLI INTENSITY EXCLUDING THE NEW MADRID SERIES

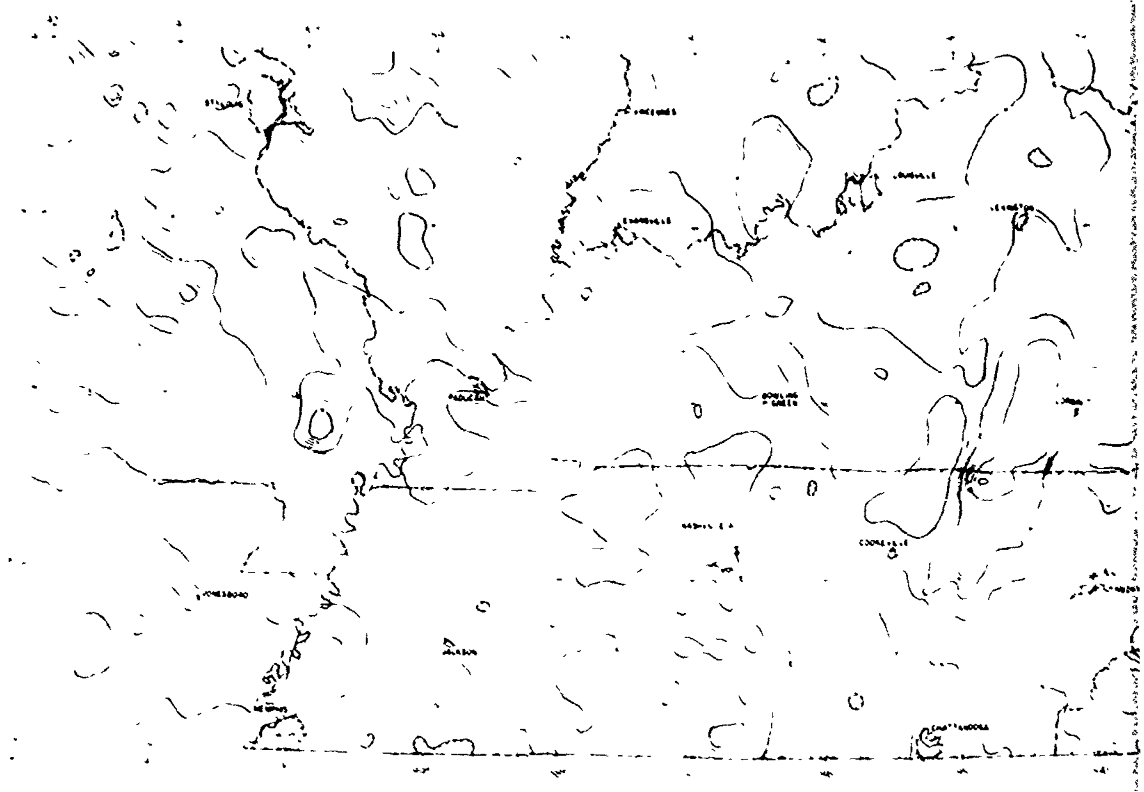
EARTHQUAKE POTENTIAL OF ST LOUIS DISTRICT

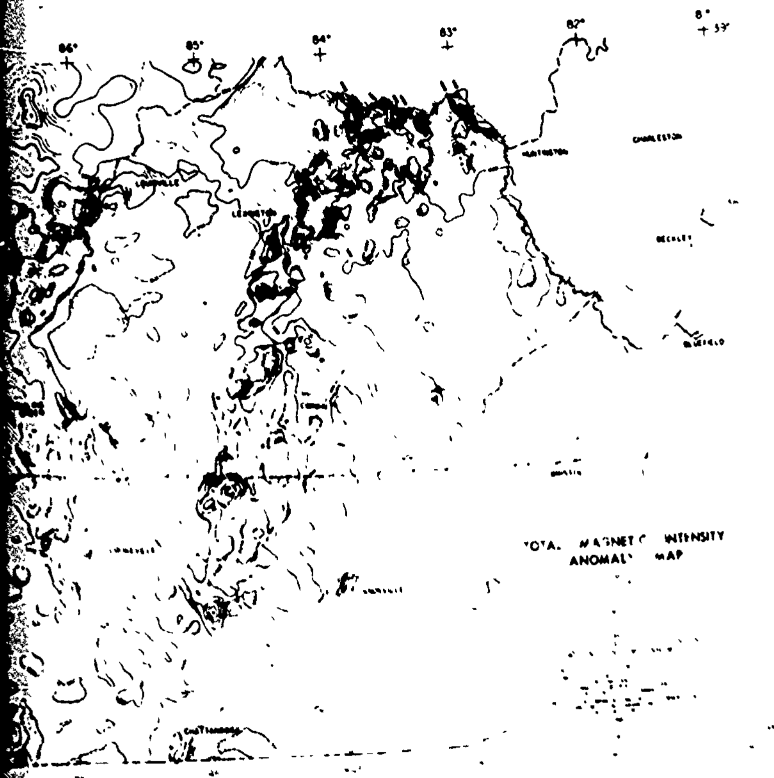
F

SHEET 9 OF 13

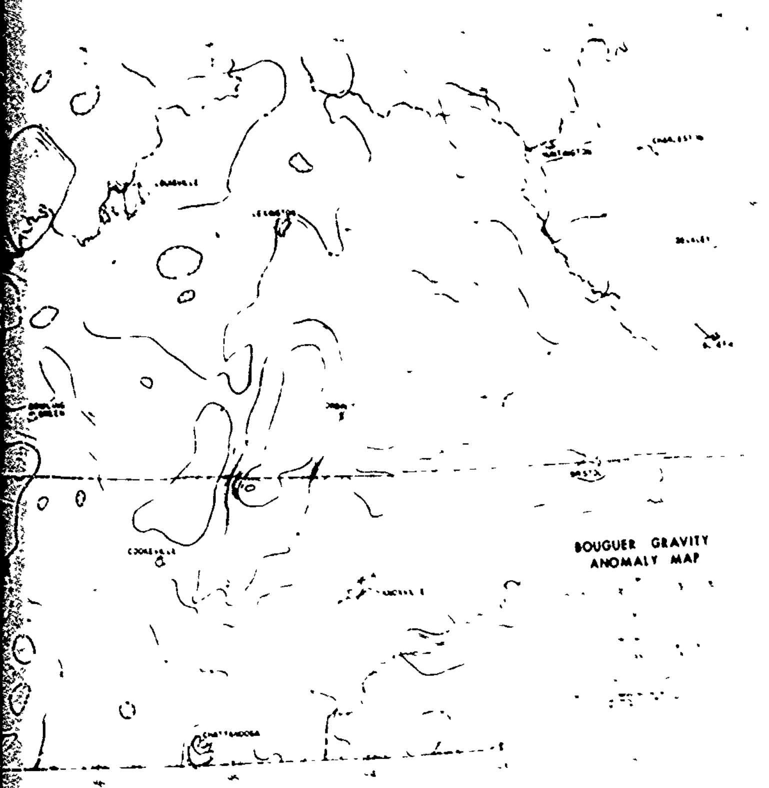
2


92°
39°
91°
90°
89°
88°
87°
86°
85°
84°
38°
35°





TOTAL MAGNETIC INTENSITY ANOMALY MAP



BOUGUER GRAVITY ANOMALY MAP

DATE DECEMBER 980

SUBMITTED

HEAD GEOLOGY SECTION

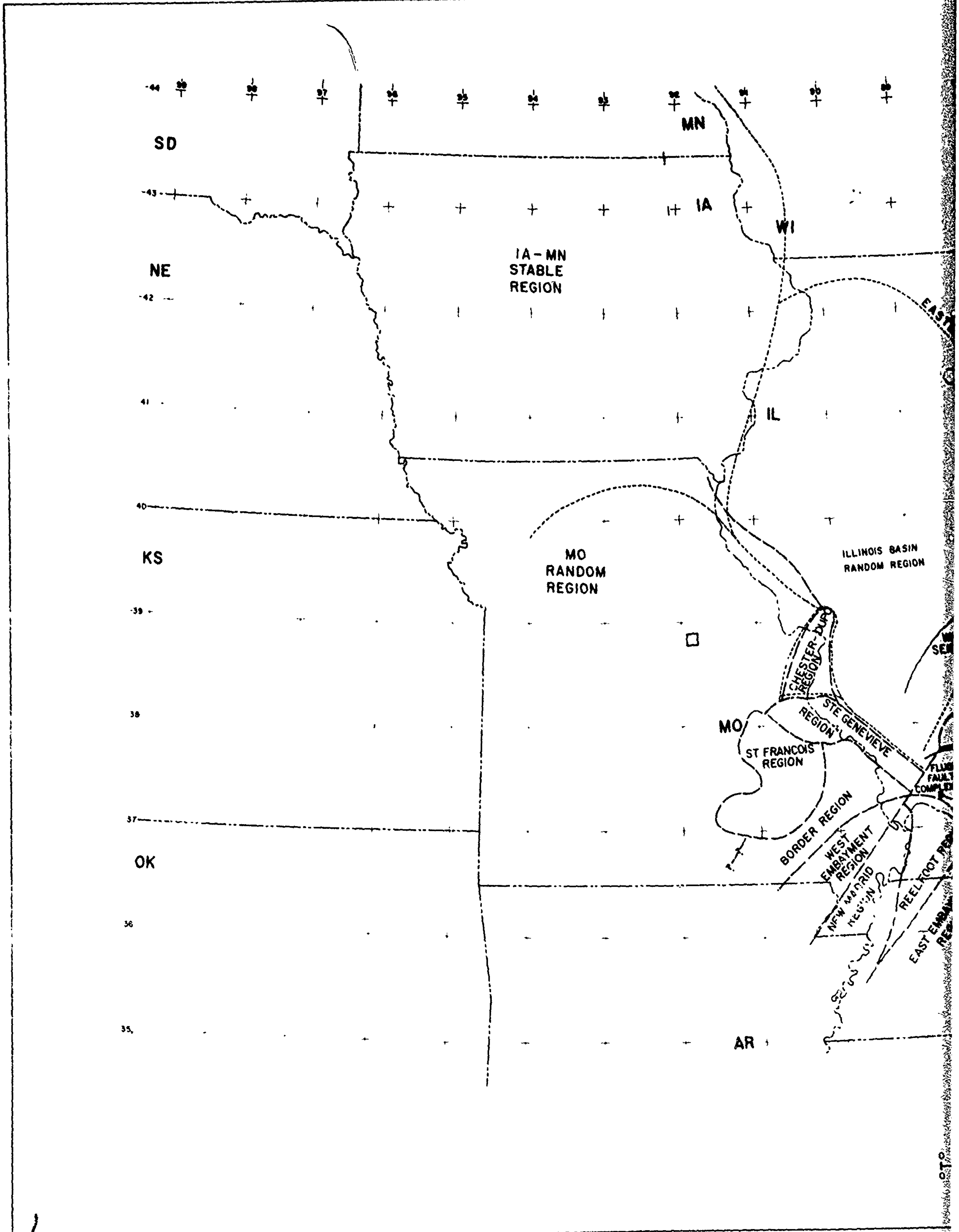
APPROVED

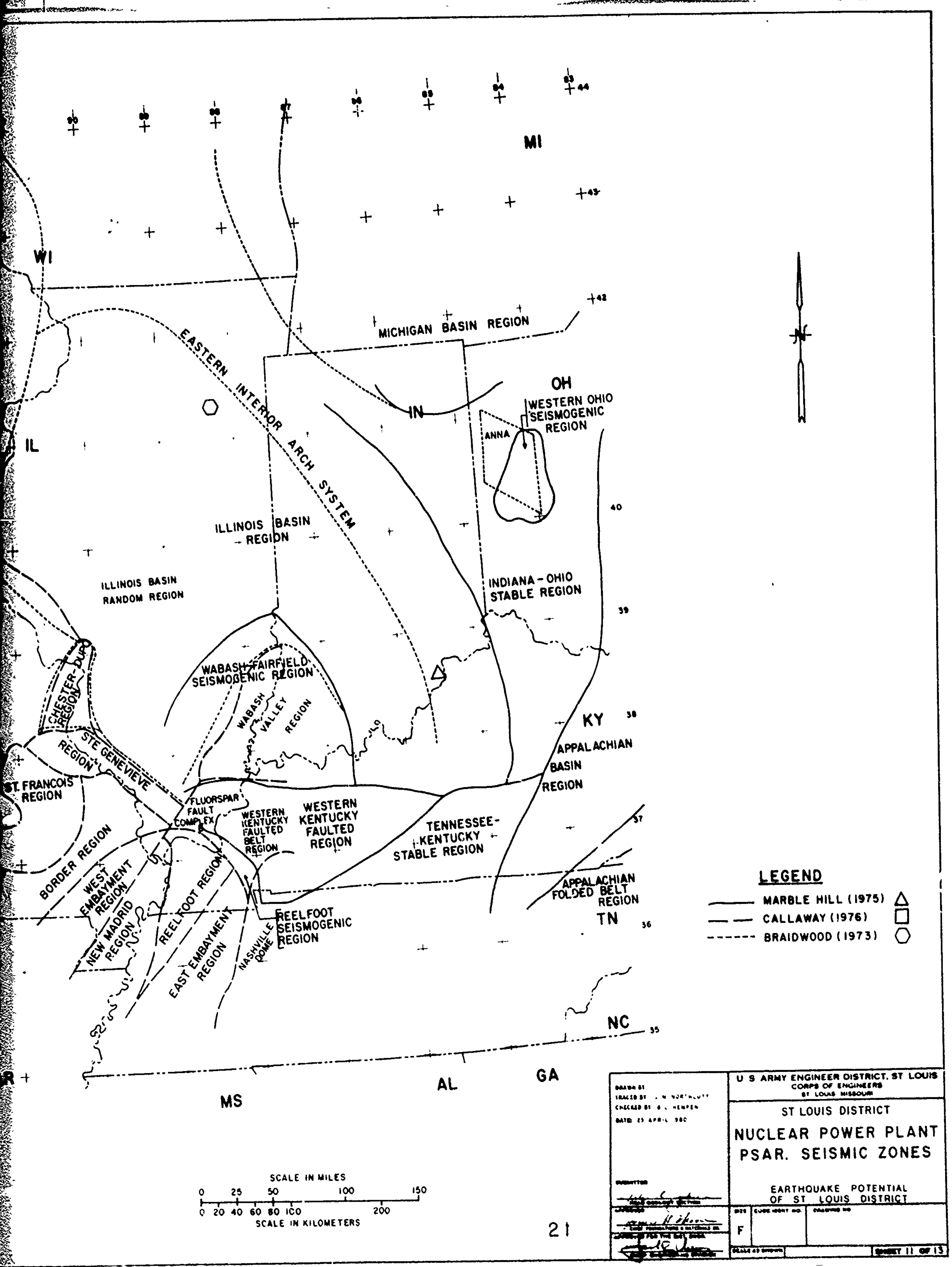
U S ARMY ENGINEER DISTRICT, ST LOUIS
CORPS OF ENGINEERS
ST LOUIS MISSOURI

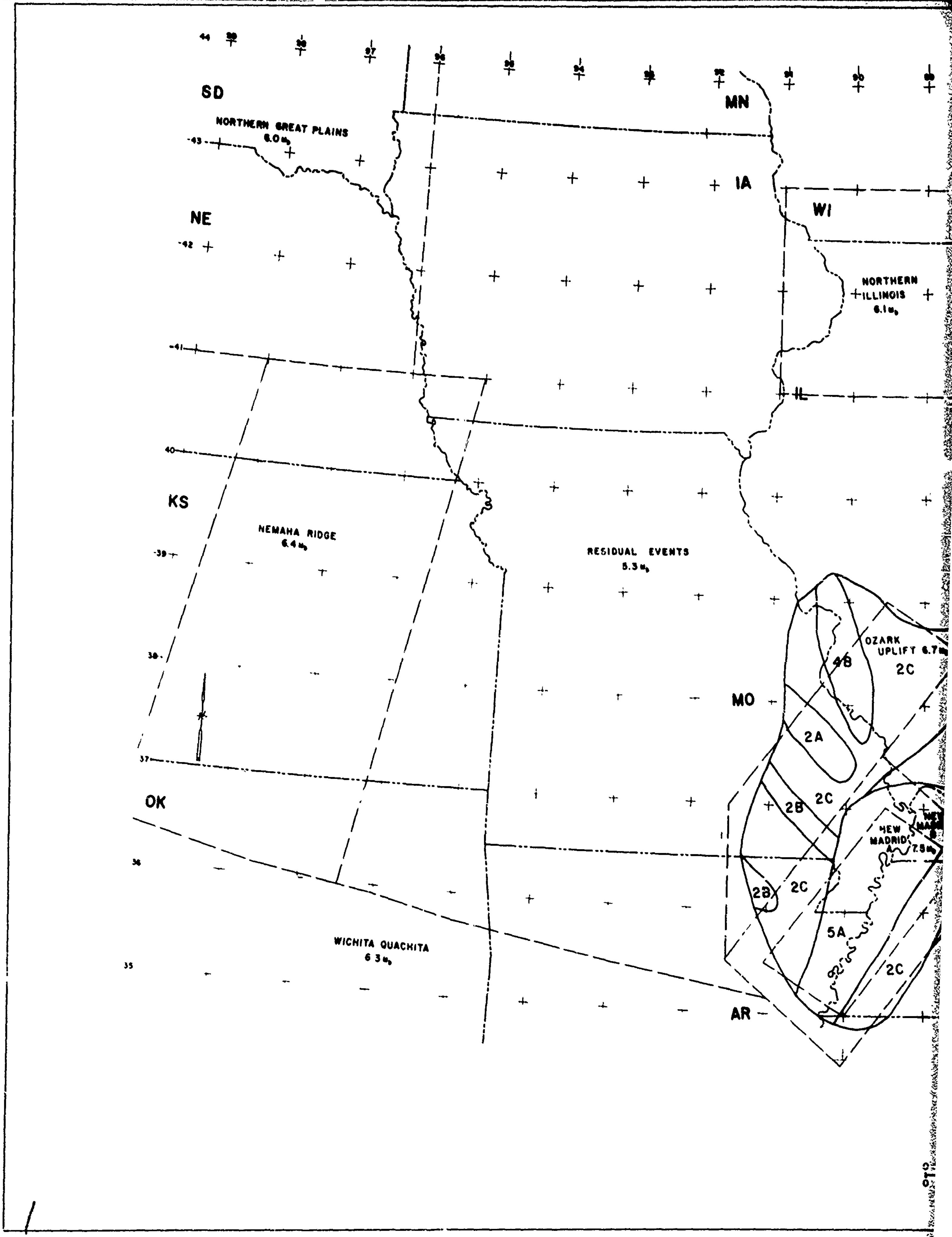
ST LOUIS DISTRICT
MAGNETIC INTENSITY (JOHNSON, ET AL, 1980) & BOUGUER GRAVITY ANOMALY (KELLER, ET AL, 1980) MAPS
EARTHQUAKE POTENTIAL OF THE ST LOUIS DISTRICT

SIZE	CODE IDENT NO	DRAWING NO
F	DACW 43	

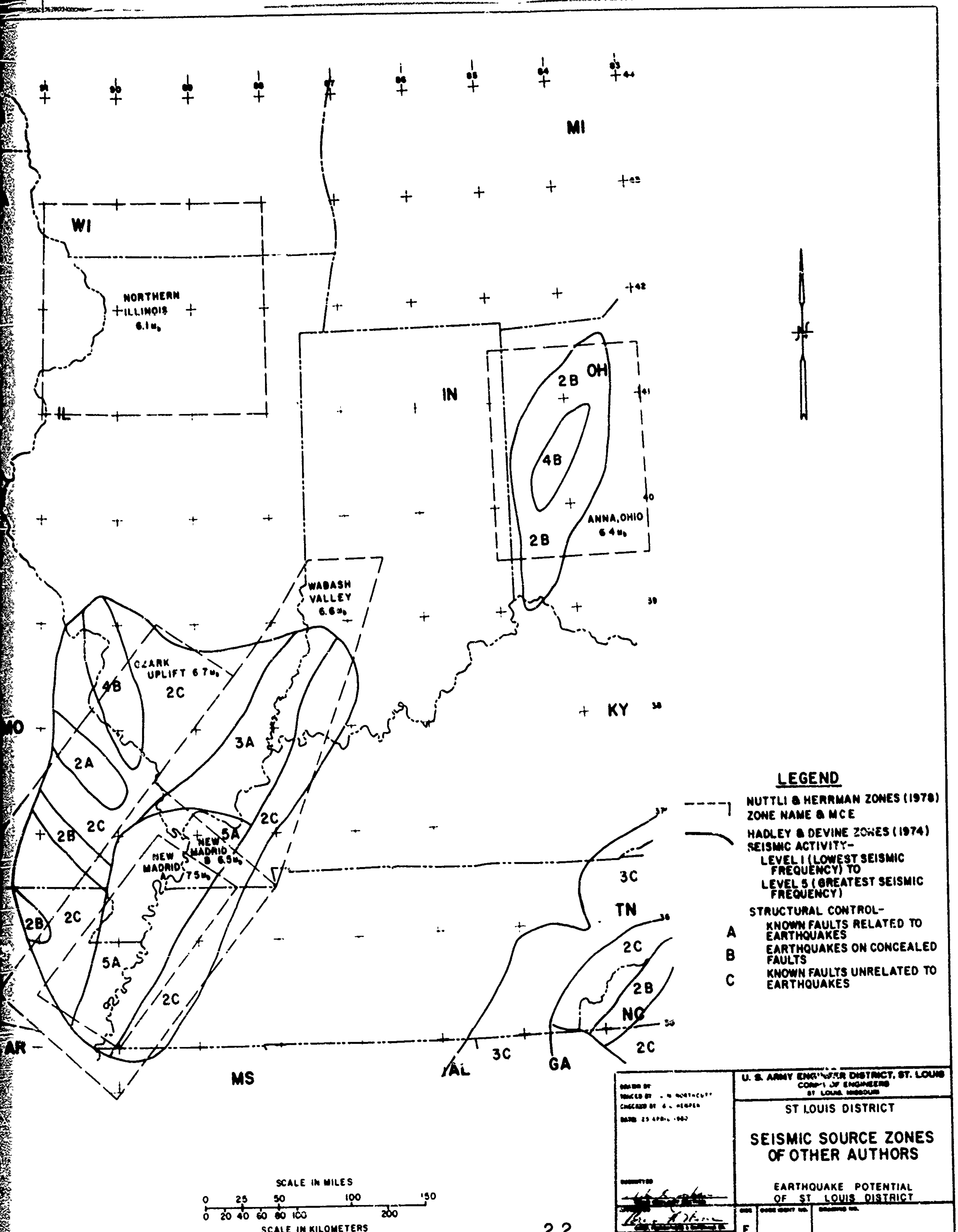
SCALE AS SHOWN | SHEET 10 OF 13


SD
MN
IA
WI
NE
IA-MN
STABLE
REGION
IL
KS
MO
RANDOM
REGION
ILLINOIS BASIN
RANDOM REGION
CHESTER-DUPO
REGION
STE GENEVIEVE
REGION
MO
ST FRANCOIS
REGION
BORDER REGION
WEST
EMBAYMENT
REGION
NEW MADRID
REGION
REELFOOT
OK
AR


MI
WI
IL
IN
OH
KY
TN
NC
GA
AL
MS
MICHIGAN BASIN REGION
EASTERN INTERIOR ARCH SYSTEM
ANNA
WESTERN OHIO SEISMOGENIC REGION
ILLINOIS BASIN REGION
ILLINOIS BASIN RANDOM REGION
INDIANA - OHIO STABLE REGION
WABASH-FAIRFIELD SEISMOGENIC REGION
WABASH VALLEY REGION
CHESTER-DUPO REGION
STE GENEVIEVE REGION
ST. FRANCOIS REGION
APPALACHIAN BASIN REGION
FLUORSPAR FAULT COMPLEX
WESTERN KENTUCKY FAULTED BELT REGION
WESTERN KENTUCKY FAULTED REGION
TENNESSEE-KENTUCKY STABLE REGION
APPALACHIAN FOLDED BELT REGION
BORDER REGION
WEST EMBAYMENT REGION
NEW MADRID REGION
REELFOOT REGION
EAST EMBAYMENT REGION
NASHVILLE DOME
REELFOOT RIFT REGION
REELFOOT SEISMOGENIC REGION
N
LEGEND
MARBLE HILL (1975)
CALLAWAY (1976)
BRAIDWOOD (1973)
SCALE IN MILES
0 25 50 100 150
0 20 40 60 80 100 200
SCALE IN KILOMETERS
U S ARMY ENGINEER DISTRICT, ST LOUIS
CORPS OF ENGINEERS
ST LOUIS MISSOURI
ST LOUIS DISTRICT
NUCLEAR POWER PLANT
PSAR. SEISMIC ZONES
EARTHQUAKE POTENTIAL
OF ST LOUIS DISTRICT
F
SHEET 11 OF 13



SD
MN
NORTHERN GREAT PLAINS
6.0 m_b
IA
WI
NE
NORTHERN ILLINOIS
6.1 m_b
IL
KS
NEMAHA RIDGE
6.4 m_b
RESIDUAL EVENTS
5.3 m_b
MO
OZARK UPLIFT 6.7 m_b
4B
2C
2A
2B
2C
NEW MADRID A
7.5 m_b
2B
2C
5A
2C
OK
WICHITA QUACHITA
6.3 m_b
AR



U. S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

ST LOUIS DISTRICT

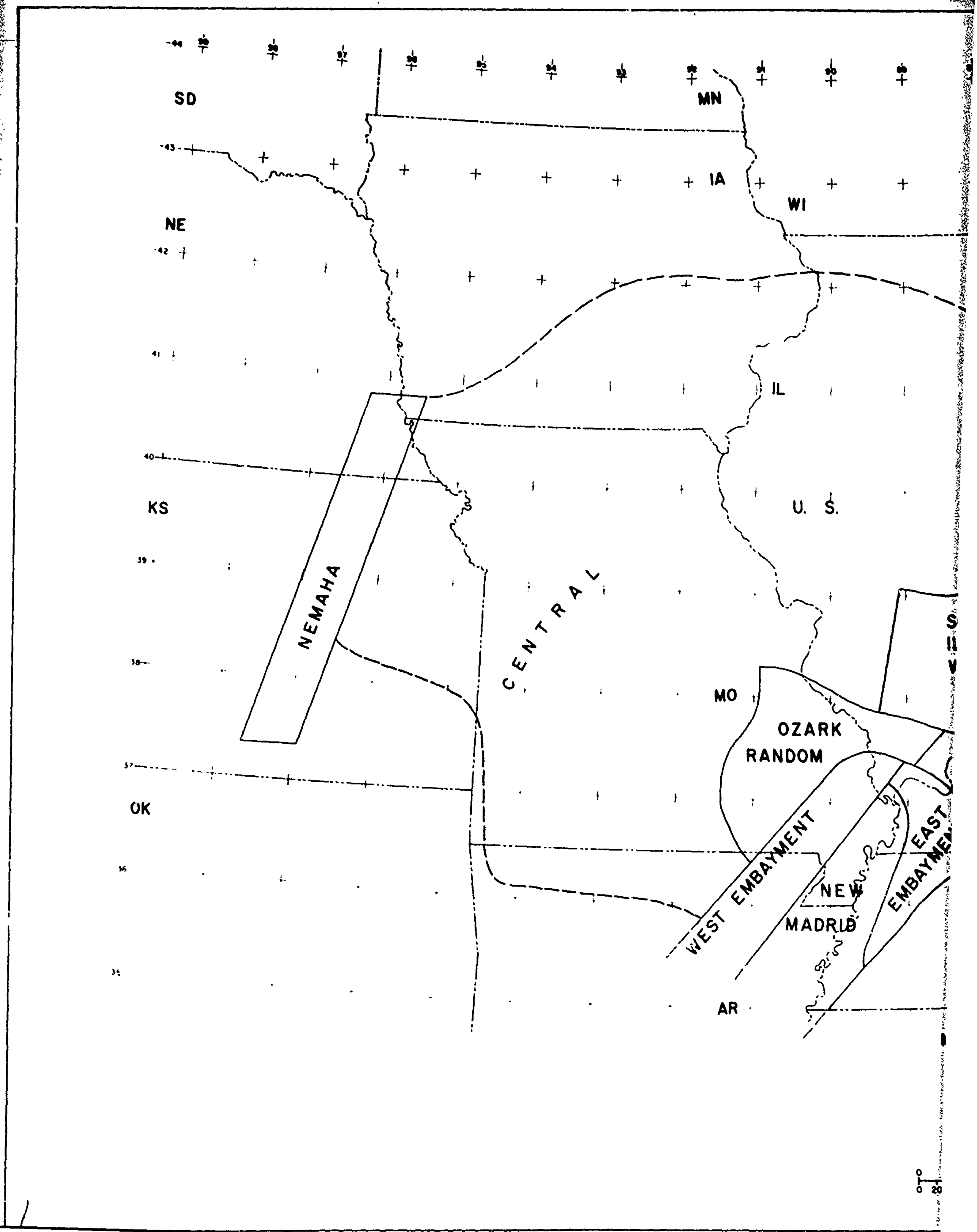
SEISMIC SOURCE ZONES
OF OTHER AUTHORS

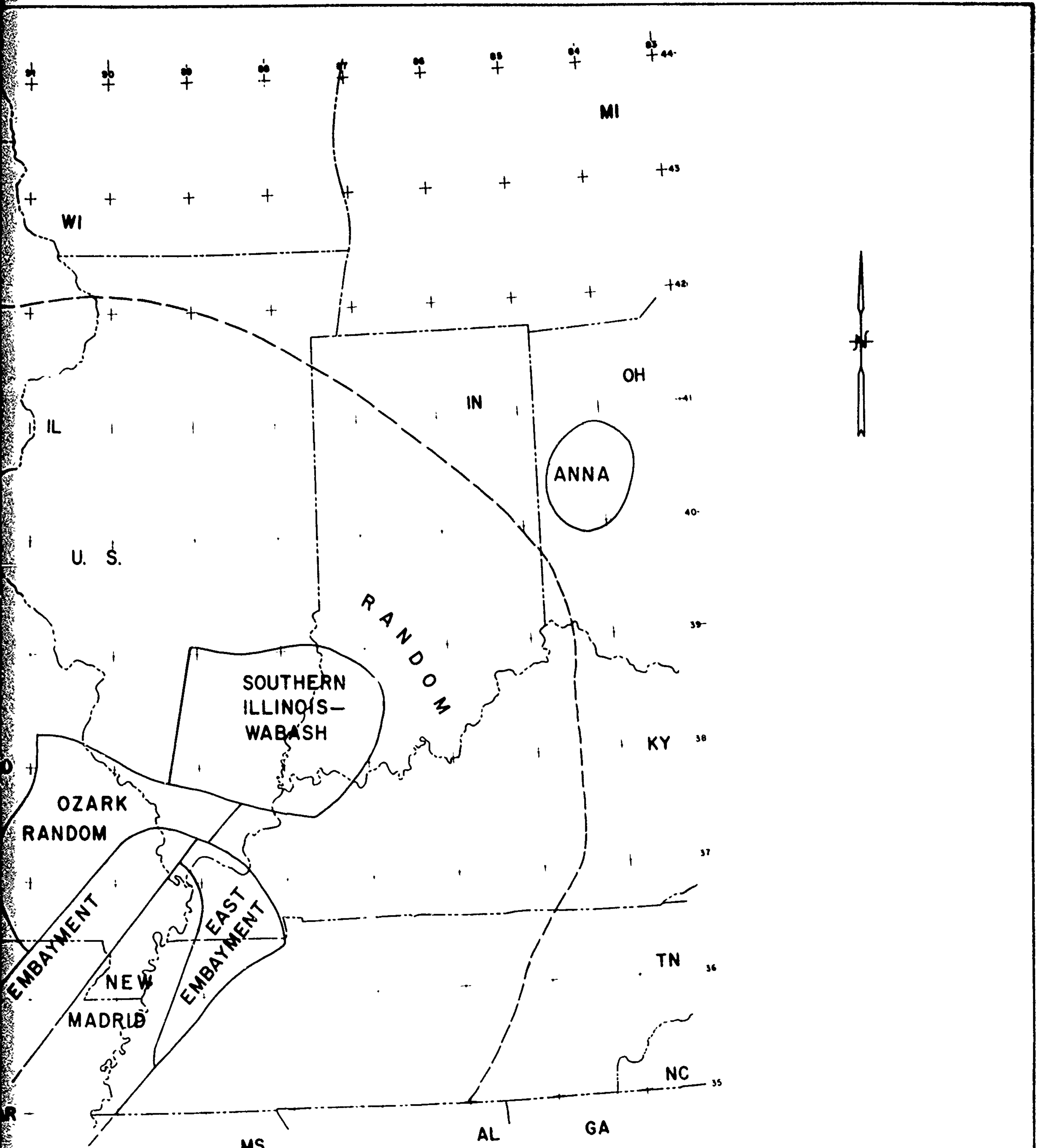
EARTHQUAKE POTENTIAL
OF ST LOUIS DISTRICT

F

SHEET 2 OF 13

2


SD
MN
IA
WI
NE
IL
KS
U. S.
NEMAHA
CENTRAL
MO
OZARK
RANDOM
OK
WEST EMBAYMENT
EAST
EMBAYMENT
NEW
MADRID
AR



SCALE IN MILES
0 25 50 100 150
0 20 40 60 80 100 200
SCALE IN KILOMETERS

DRAWN BY: G. L. HEMPEN
TRACED BY: J. M. NORTHCUTT
CHECKED BY: M. J. KLOSTERMAN
DATE: NOVEMBER 1980

U. S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

ST LOUIS DISTRICT
EARTHQUAKE SOURCE ZONES
EARTHQUAKE POTENTIAL OF THE ST. LOUIS DISTRICT

F

13 of 13

APPENDIX A

Lists of Historic Earthquakes

1. Historic Earthquakes by Chronological Date.
2. Earthquakes with Both Magnitude and Intensity Determined.
3. Historic Earthquakes by Zones (foreshocks, aftershocks and swarms removed: only primary or main earthquakes listed).

All three lists are derived from the same set of references.

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 TUCKER BOULEVARD NORTH
ST. LOUIS, MISSOURI 63101

LMSED-FG

HISTORIC EARTHQUAKES
$35^{o}N$-$44^{o}N$; $84^{o}W$-$98.5^{o}W$

16 January 1981

This list was last corrected on 16 January 1981. As new sources of information are available, the data base will be revised. Column headings of the earthquake list, the capitalized words, are described as follows. The DATE is the date of each event by local time. LOCALITY and LAT/LONG are estimates of the largest damaged urban and most accurate geographic locations, determined from the general location of shaking, the meisoseismic area, or the epicenter of the event. LOCALITY also contains pertinent earthquake remarks on the number, series, or sizes of earthquakes. MAG is the body wave magnitude, m_b, of the event; a parenthesis indicates a noninstrumental estimate of magnitude for that event. INTENSITY is the maximum value of Modified Mercalli intensity, I_o, for the event. The SOURCE utilized, see abbreviations below, is that reference which gives the most information for our purposes.

Intra-State Location	
North	N
Northeast	NE
East	E
Southeast	SE
South	S
Southwest	SW
West	W
Northwest	NW
Central	C

State Designation			
Alabama	AL	Mississippi	MS
Arkansas	AR	Missouri	MO
Georgia	GA	Nebraska	NE
Illinois	IL	North Carolina	NC
Indiana	IN	Ohio	OH
Iowa	IA	Oklahoma	OK
Kansas	KS	South Dakota	SD
Kentucky	KY	Tennessee	TN
Michigan	MI	Wisconsin	WI
Minnesota	MN		

Information Sources

CG: Coast and Geodetic Survey. United States Earthquakes (1928-1968). United States Government Printing Office, Washington, D.C.: 1948-1970.

CI: National Oceanic and Atmospheric Administration and United States Geological Survey. United States Earthquakes, (1973-1977). United States Government Printing Office, Washington, D.C.: 1975-1979.

Cn: National Oceanic and Atmospheric Administration and Environmental Data Service. Earthquake History of the United States (thru 1970). United States Government Printing Office, Washington, D.C.: 1972; National Oceanic and Atmospheric Administration and Environmental Data Service. United States Earthquakes, 1969-1972. United States Government Printing Office. Washington, D.C.: 1971-1974.

D: Docekal, Jerry. Earthquakes of the Stable Interior with Emphasis on the Midcontinent. University of Nebraska, Order No. 71-2880, Ph.D. Thesis, 1970.

DuW: DuBois, Susan M., and Frank W. Wilson. "List of Earthquake Intensities for Kansas, 1867-1977," Kansas Geological Survey Environmental Geology Series 2. Kansas Geological Survey and the University of Kansas. 1978.

EERI: Earthquake Engineering Research Institute. Newsletter, 14(5): 1980.

E: United States Geological Survey. Earthquake Information Bulletin. Vol IX to latest issue: 1977-to latest date.

I: Varma, Madan M. Seismicity of the Eastern Half of the United States. Indiana University, Ph.D. Thesis. Bloomington, Indiana: 1975.

N: Nuttli, Otto W. "The Mississippi Valley Earthquakes of 1811 and 1812: Intensities, Ground Motion and Magnitudes," Bulletin of the Seismological Society of America. 63(1): 227-248, February, 1973. "Magnitude-Recurrence Relation for Central Mississippi Valley Earthquakes," Bulletin of the Seismological Society of America. 64(4): 1189-1207, August, 1974. Nuttli, O. W., and Robert B. Herrmann. "State-of-the-Art for Assessing Earthquake Hazards in the United States; Credible Earthquakes for the Central United States." Miscellaneous Paper S-73-1, Report 12. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi: 1978.

O: Lawson, James E, Jr., et al. Catalog of Oklahoma Earthquakes. University of Oklahoma, Earth Sciences Observatory. 1977.

P: United States Geological Survey. Preliminary Determination of Epicenters, Monthly Listing. United States Government Printing Office, Washington, D.C.: January 1975-December 1977, May-June 1980.

SL: St. Louis University, Department of Earth and Atmospheric Sciences. Southeast Missouri Regional Seismic Network, Quarterly Bulletin, Nos. (1-last): 1973-to latest issue.

V: Bollinger, G.A., "A Catalog of Southeastern United States Earthquakes, 1754 through 1974," Department of Geological Sciences Research Bulletin 101. Virginia Polytechnic Institute and State University. 1975. Bollinger, G.A., et al. "Seismicity of the Southeastern United States," Southeastern U.S. Seismic Network Bulletin. Nos. (1-last): August 1978-to latest issue.

HISTORIC EARTHQUAKES

35°N-44°N; 84°W-98.5°W

16 January 1981

DATE	LOCALITY	N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)	INFO SOURCE
25 Dec 1699	SW TN/NE AR	35.2	90.5	(4.0)	V	D/N
1779	N KY			(3.0)		N
Apr 1791	NE KY			(4.0)	V	N
8 Jan 1795	Kaskaskia, (SW) IL/EC MO/WC KY	37.9	89.9	(4.0)	V	CI/N
24 Aug 1804	Fort Dearborn (Chicago), (NE) IL	42.0	87.8	(4.5)	VI	CI/N
16 Dec 1811	New Madrid, (SE) MO (550+ series)	36.0	90.0	(7.2)	XI	D/N
23 Jan 1812	New Madrid, (SE) MO (160+ series)	36.3	89.6	(7.1)	XI	D/N
7 Feb 1812	New Madrid, (SE) MO (1160+ series)	36.5	89.6	(7.4)	XII	N
25 Jul 1816	SE MO	36.5	89.5	(3.6)	III	D/N
25 Jul 1816	SE MO	36.5	89.5	(3.6)	III-IV	N
12 Dec 1817	KY			(3.0)		N
Mar 1818	Caruthersville, (SE) MO	36.2	89.7	(3.4)	III	D/N
11 Apr 1818	SC IL	38.6	90.2	(3.6)	IV	N
2 Sep 1819	SE MO	37.7	89.7	(4.2)	V	N
16 Sep 1819	Cape Girardeau, (SE) MO/SW IL	38.1	89.8	(3.8)	IV	D/N
17 Sep 1819	Cape Girardeau, (SE) MO/SW IL	38.1	89.8	(3.6)	IV	D/N
1820	SE MO/NW TN	36.6	89.5	(3.6)	III-IV	N
9 Nov 1820	Cape Girardeau, (SE) MO/S IL	37.3	89.5	(4.2)	V	N/CI
5 Jul 1827	New Albany, (SE) IN/NC KY	38.3	85.8	(4.8)	IV	N
6 Aug 1827	New Albany, (SE) IN/NC KY	38.3	85.8	(4.7)	VI	Cn/N
7 Aug 1827	New Albany, (SE) IN/NC KY	38.3	85.8	(4.7)	VI	Cn/N
14 Aug 1827	St. Louis, (EC) MO/WC IL	38.6	90.2	(3.4)	III	N
1829	Cherokee, (NW) NC	35.	84.			V
May 1829	Jackson, (WC) TN	35.6	88.8	(3.0)		D/N
4 Feb 1833	SW MI	42.3	85.6	(4.7)	VI	N
20 Nov 1834	NC KY	38	85	(4.2)	V	D/N
9 Jun 1838	St. Louis, (EC) MO/S IL	38-1/2	89	(5.7)	VII-VIII	CI/N
5 Sep 1839	Mayfield, (SW) KY	36.7	88.6	(3.8)	IV	D/N
27 Dec 1841	Hickman, (SW) KY/SE MO	36.6	89.2	(4.2)	V	Cn/N
27 Mar 1842	Hickman, (SW) KY	36.5	89.2	(3.7)	IV	I
27 May 1842	SW KY/SE MO	36.6	89.2	(3.8)	IV	N
4 Nov 1842	Hickman, (SW) KY/SE MO	36.6	89.2	(4.2)	V	D/N
4 Nov 1842	Hickman, (SW) KY/SE MO	36.6	89.2	(4.2)	V	D/N
4 Jan 1843	Memphis, (SW) TN/NE AR	35.5	90.5	(6.0)	VIII	Cn/N
16 Feb 1843	Memphis, (SW) TN/NE AR	35.5	90.5	(4.8)	V	Cn/N
16 Feb 1843	St. Louis, (EC) MO	38.6	90.2	(4.0)	IV	I
13 Jun 1843	Hickman, (SW) KY/SE MO	36.6	89.2	(3.4)	III	D/N
9 Aug 1843	Columbia & Somerville, (WC) TN	35.8	88.2	(4.2)	III-IV	D/N
25 Nov 1844	Knoxville, (EC) TN	36.0	83.9	(4.7)	VI	Cn/N
1845	NW OH	41.1	84.2	(3.0)	II	D/N
23 Mar 1846	New Madrid, (SE) MO/NW TN	36.6	89.6	(3.4)	III	D/N

DATE	LOCALITY	N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)	INFO SOURCE
24 Jan 1849	Hickman, (SW) KY/SE MO	36.6	89.2	(4.2)	V	D/N
4 Apr 1850	Louisville, (NC) KY/SC IN	38.3	85.8	(4.2)	V	D/N
28 Aug 1853	Hickman, (SW) KY/SE MO	36.6	89.2	(3.4)	III	D/N
12 Dec 1853	NW TN/SW KY	36.6	89.2	(4.5)	IV-V	N
18 Dec 1853	Hickman, (SW) KY/SE MO	36.6	89.2	(4.5)	IV-V	D/N
12 Feb 1854	Manchester, (SE) KY	37.2	83.8	(3.6)	III-IV	D/N
13 Feb 1854	Manchester, (SE) KY	37.2	83.8	(3.6)	III-IV	D/N
28 Feb 1854	EC KY	37.6	84.5	(4.2)	IV-V	N
8 Mar 1854	NC KY	38.2	85.2	(3.8)	IV	N
2 May 1855	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.8)	IV	D/N
3 May 1855	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.4)	III	N
9 Nov 1856	New Madrid, (SE) MO/NW TN	36.6	89.5	(4.4)	IV	D/N
Feb 1857	New Madrid, (SE) MO/NW TN	36.6	89.5	(3.8)	IV	D/N
8 Oct 1857	St. Louis, (EC) MO/S IL	38.7	89.2	(5.3)	VII	CI/N
21 Sep 1858	Line Shore, (SW) KY/NW TN	36.5	89.2	(4.7)	VI	D/N
1860	LeSueur, (SE) MN	44.5	93.9	(5.2)	VI	I
7 Aug 1860	Henderson, (WC) KY/SW IN	37.8	87.5	(4.4)	V	D/N
17 Aug 1865	New Madrid, (SE) MO/NW TN	36.5	89.5	(5.3)	VII	D/N
7 Sep 1865	New Madrid, (SE) MO/NW TN	36.6	89.5	(3.6)	III-IV	D/N
24 Apr 1867	Wamego & Lawrence, (NE) KS	39.5	96.7	(5.3)	VII	DuW/Cn/N
28 Apr 1867	Nebraska City, (SE) NE/SW IA	40.7	95.8	(3.8)	IV	D/N
21 Nov 1868	Hickman, (SW) KY/SE MO	36.6	89.2	(3.4)	III	D/N
20 Feb 1869	Lexington, (NC) KY	38.1	84.5	(4.2)	V	N
14 Dec 1870	Hickman, (SW) KY/SE MO	36.6	89.2	(3.6)	III-IV	D/N
24 Jul 1871	Cairo, (S) IL/SW KY/SE MO	37.0	90.0	(3.4)	III	N
25 Jul 1871	St. Clair Co, (SW) IL	38.5	90.0	(3.6)	III	D/N
6 Feb 1872	Wenona, (EC) MI	(3) 43.5	83.8	(4.2)	V	Cn/N
8 Feb 1872	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.6)	III	D/N
26 Mar 1872	Paducah, (SW) KY/S IL	37.1	88.6	(3.4)	III	D/N
20 Apr 1872	Memphis, (SW) TN/NW MS	35.1	90.0	(3.4)	III	D/N
8 Jul 1872	Chillicothe, (NC) MO	39.8	93.5	(3.8)	IV	N/D
20 Aug 1872	Memphis, (SW) TN/NW MS	35.1	90.0	(3.2)	II-III	N
9 Oct 1872	Sioux City, (NW) IA/NE NE/SW SD	42.7	97.0	(4.2)	V	Cn/N
22 Apr 1873	Dayton, (WC) OH	39.7	84.2	(3.6)	IV	D/N
3 May 1873	NE AR/NW TN	36.6	89.6	(4.2)	IV	N
22 Aug 1873	Memphis, (SW) TN/NW MS	35.1	90.0	(3.2)	II-III	D/N
9 Jul 1874	Cairo, (S) IL/SW KY	37.0	89.2	(3.6)	III-IV	N
23 Jul 1874	Camp Russell, NE			(3.4)	III	N
18 Jun 1875	Champaign Co, (WC) OH	40.2	84.0	(5.3)	VII	N
7 Oct 1875	Memphis, (SW) TN/SC IL/SE MO	36.1	89.6	(4.3)	III-IV	D/N
27 Oct 1875	Memphis, (SW) TN/NW MS	35.1	90.0	(3.8)	IV	N
8 Nov 1875	Topeka & Valley Falls, (NE) KS	39.3	95.5	(4.2)	V	D/DuW/N
12 Nov 1875	Knoxville, (EC) TN	36.0	84.0		III-IV	V
9 Dec 1875	Nebraska City, (SE) NE/SW IA	40.7	95.8	(3.4)	III	D/N
27 Jan 1876	Adrian, (SC) MI	41.9	84.0	(3.0)		D/N
Jun 1876	EC OH	40.4	84.2	(4.2)		N
24 Sep 1876	Friendsville, (SE) IL/SW IN	38.5	87.8	(4.7)	VI	D/N

DATE	LOCALITY	N LAT	W LONG	MAG (m) b	INTENSITY (max. MM)	INFO SOURCE
25 Sep 1876	Evansville, (SW) IN/SE IL	38.5	87.8	(4.7)	VI	Cn/N
26 Sep 1876	Friendsville, (SE) IL/SW IN	38.5	87.8	(3.4)	III	N
23 Jan 1877	Brown Co & Adams Co, (SC) OH/NE KY	38.8	83.5	(3.4)	III	D/N
25 May 1877	Knoxville, (EC) TN	36.0	84.0		III-IV	V
26 May 1877	New Harmony, (SW) IN/SE IL	38.2	87.9	(3.6)	III-IV	D/N
3 Jun 1877	Stanford, (C) KY	37.5	85.7	(3.4)	III	D/N
14 Jul 1877	SE MO	36.8	89.7	(4.3)	III-IV	N
14 Jul 1877	Memphis, (SW) TN/NW MS	36.8	89.7	(4.3)	III-IV	D/N
15 Jul 1877	New Madrid, (SE) MO	36.8	89.7	(4.3)	III-IV	D/N
15 Nov 1877	Seward Co, (EC) NE (2)	41.	97.	(5.3)	VII	N/I
16 Nov 1877	EC TN/SW NC	35.5	84.0	(4.2)	V	Cn/N
19 Nov 1877	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.6)	III-IV	D/N
8 Jan 1878	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.6)	III-IV	D/N
12 Mar 1878	Columbus, (SW) KY/SE MO	36.8	89.1	(4.2)	V	Cn/N
18 Nov 1878	SE MO	36.7	89.3	(4.9)	VI	CI/N
23 Nov 1878	Murphy, (SW) NC	35.	84.		III-IV	V
Mar 1879	Kirwin, (NC) KS	39.6	99.1	(4.0)	IV-V	DuW/N
26 Jul 1879	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.4)	II-III	D/N
25 Sep 1879	Memphis, (SW) TN/NW MS	35.3	90.3	(3.9)	III-IV	D/N
29 Dec 1879	Yankton & Ft. Sully, (SE) SD/NE NE	42.9	97.3	(4.0)	V	N/D
13 Jul 1880	Memphis, (SW) TN/NW MS	35.3	90.3	(4.1)	IV	N
30 Nov 1880	Ashwood, (C) TN	35.6	87.3	(3.4)	III	D/N
20 Apr 1881	Goshen, (NE) IN	41.6	85.8	(3.8)	IV	D/N
19 May 1881	Lawrence, (EC) KS	38.9	95.2	(3.4)	III	D/N
27 May 1881	LaSalle, (NC) IL	41.3	89.1	(4.7)	IV	D/N
29 Aug 1881	Hillsboro, (SC) OH	39.2	83.7	(3.4)	III	D/N
7 Oct 1881	Memphis, (SW) TN/NW MS	35.1	90.0	(3.8)	IV	D/N
9 Feb 1882	Botkins & Swanders, (WC) OH	40.4	84.2	(4.2)	V	D/N
20 Jul 1882	Cairo, (S) IL/SE MO	36.9	89.2	(4.2)	V	D/N
28 Jul 1882	Ironton, (SE) MO	37.6	90.6	(4.1)	III-IV	D/N
27 Sep 1882	WC IL	39	89-1/2	(4.7)	IV	D/N
14 Oct 1882	WC IL/EC MO	39	89-1/2	(4.2)	V	D/N
15 Oct 1882	WC IL	39	89-1/2	(4.2)	V	N
15 Oct 1882	Murphy, (SW) NC	35.1	84.0		III-IV	V
22 Oct 1882	Scott Co, (WC) AR	35.	94.	(5.2)	VI-VII	CN/I
22 Oct 1882	Greenville, (SE) IL	38.9	89.4	(3.4)	III	D/N
15 Nov 1882	St. Louis, (EC) MO/SW IL	38.6	90.2	(3.6)	III	N
6 Jan 1883	N OH (2)			(3.0)		D/N
8 Jan 1883	Memphis, (SW) TN	35.1	90.1			I
10 Jan 1883	Anna, (SW) IL/SE MO	37.4	89.3	(3.4)	III	D/N
11 Jan 1883	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(4.6)	VI	Cn/N
4 Feb 1883	Kalamazoo, (SW) MI/NC IN	42.3	85.6	(4.7)	IV	D/N
12 Apr 1883	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(4.0)	VI	Cn/N
11 Jun 1883	NW MS/SW TN (3)	35.1	90.0	(4.7)	VI	D/N
6 Jul 1883	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.4)	III	N
14 Jul 1883	Wickliffe, (SW) KY/SE MO/S IL	37.0	89.1	(4.1)	IV-V	D/N
14 Nov 1883	St. Louis, (EC) MO/SW IL	38.7	90.2	(3.8)	IV	D/N
5 Dec 1883	Roverdon Springs, (NE) AR	36.3	91.2	(4.2)	V	Cn/N
15 Feb 1884	Caledonia, (SE) MO/SE MO	37.7	90.7	(3.4)	III	D/N
31 Mar 1884	College Hill, (SW) OH	39.5	84.7	(3.0)	II	D/N
30 Apr 1884	Cherokee, (NW) NC	35.1	84.0			V
24 Aug 1884	Knoxville, (EC) TN	36.0	84.0		III-IV	V
19 Sep 1884	Lima, (WC) OH	40.7	84.1	(4.7)	VI	Cn/N
29 Nov 1884	Covington, (WC) TN	35.5	89.7	(4.0)	IV	D/N
23 Dec 1884	Anna, (WC) OH	40.4	84.2	(3.4)	III	D/N
21 Feb 1885	Carthage, (SW) MO/SE KS	37.2	94.3	(3.4)	III	D/N
26 Dec 1885	Bloomington, (C) IL	40.5	89.0	(3.4)	III	D/N
1 Mar 1886	Butlerville, (SE) IN	39.0	85.5	(3.6)	III-IV	D/N
17 Mar 1886	Makanda, (S) IL	37.0	89.2	(4.7)	IV	D/N
18 Mar 1886	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.9)	III-IV	N
13 Aug 1886	Indianapolis, (WC) IN	39.7	86.1	(3.6)	III-IV	D/N
6 Feb 1887	Vincennes, (SW) IN/SE IL	38.7	87.5	(4.7)	VI	Cn/N
2 Aug 1887	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(4.7)	V	Cn/N
3 Nov 1888	Memphis, (SW) TN/NW MS	35.4	90.4	(3.8)	IV	D/N
5 Jun 1889	Memphis, (SW) TN/NW MS	35.1	90.0	(3.4)	III	N
6 Jun 1889	Nunnelly & Milan, (WC) TN	35.9	88.1	(3.9)	III-IV	D/N
19 Jul 1889	Memphis, (SW) TN/NW MS	35.2	90.0	(3.8)	VI	CI/N
Sep 1889	Anna, (WC) OH	40.4	84.2	(3.4)	III	D/N
28 Sep 1889	Parksville, (EC) TN	35.2	84.5		III-IV	V
14 Jan 1891	Memphis, (SW) TN/NW MS	35.1	90.0	(3.6)	III-IV	D/N
26 Jul 1891	Evansville, (SW) IN/WC KY	37.9	87.5	(4.5)	VI	Cn/N
26 Sep 1891	S IL/SW IN			(5.8)	VII	N
14 Jan 1892	Memphis, (SW) TN/NW MS	35.1	90.0	(3.4)	III	D/N
Summer 1892	Anna, (WC) OH	40.4	84.2	(3.0)		D/N
18 Jul 1894	Memphis, (SW) TN/NW MS	35.0	90.0	(3.4)	III	N
19 Jul 1895	Memphis, (SW) TN	35	90		VI	E
27 Jul 1895	Savannah, (SW) TN/NW MS	35.2	88.3	(3.6)	III-IV	D/N
3 Oct 1895	Memphis, (SW) TN/EC AR	35.2	90.0	(3.4)	III	D/N
17 Oct 1895	New Madrid, (SE) MO/NW TN	36.6	89.5	(3.4)	III	D/N
18 Oct 1895	New Madrid, (SE) MO/NW TN	36.6	89.5	(3.4)	III	D/N
30 Oct 1895	Corning, (NE) AR	36.4	90.6	(3.4)	III	D/N
30 Oct 1895	Corning, (NE) AR	36.4	90.6	(3.4)	III	D/N
30 Oct 1895	Corning, (NE) AR	36.4	90.6	(3.4)	III	D/N
31 Oct 1895	Charleston, (SE) MO/S IL	37.0	89.4	(6.2)	IX	Cn/N
1 Nov 1895	Memphis, (SW) TN/SE MO	37.0	89.4	(3.8)	IV	D/N
2 Nov 1895	Charleston, (SE) MO	37.0	89.4	(3.6)	III-IV	D/N
2 Nov 1895	Charleston, (SE) MO	37.0	89.4	(3.6)	III-IV	D/N
17 Nov 1895	Charleston, (SE) MO	37.0	89.4	(3.6)	III-IV	D/N
4 Feb 1896	Hartington, (NE) NE	42.6	97.3	(3.4)	III	D/N
15 Mar 1896	Sidney, (WC) OH	40.3	84.2	(3.8)	IV	D/N
25 Apr 1897	Osceola, (NE) AR/WC TN/S IL	35.8	89.6	(4.1)	V	D/N
30 Apr 1897	SW KY	37.0	89.0	(4.0)	IV-V	N
2 Dec 1897	Kansas City, (EC) KS/NE OK	38	95	(4.5)	IV	DuW/N
26 Jan 1898	Helena, (EC) AR/NW MS	34.6	90.6	(3.8)	IV	N
29 Mar 1898	Mt. Herman, (SC) KY	36.8	85.8	(3.4)	III	V/N
14 Apr 1898	Corning, (NE) AR	36.4	90.6	(3.0)		D/N

DATE	LOCALITY	N LAT	W LONG	MAG (m) b	INTENSITY (max. MM)	INFO SOURCE
6 Jun 1898	Richmond, (EC) KY	37.7	84.3	(3.4)	III	D/N
14 Jun 1898	New Madrid, (SE) MO/WC TN	36.0	89.4	(4.5)	IV	D/N
26 Jun 1898	Richmond, (EC) KY	37.7	84.3	(3.4)	III	D/N
16 Sep 1898	NE NE	42.6	97.3	(3.8)	IV	N
29 Apr 1899	Jeffersonville&Shelbyville,(SW) IN	38.8	87.0	(5.0)	VII	CI/Cn/N
12 Jun 1899	Kenosha, (SE) WI	42.6	87.8			I
11 Oct 1899	St. Joseph, (SW) MI	42.1	86.5	(3.8)	IV	D/N
12 Oct 1899	Kenosha, (SE) WI	42.5	87.8			D
13 Nov 1899	TN			(3.0)		N
1 Dec 1899	Neosho, (SW) MO	36.8	94.4	(3.8)	IV	D/N
6 Dec 1899	Miller, (EC) SD	44.5	99.0	(3.8)	IV	D/N
3 Jan 1901	Eldora Springs, (WC) MO	37.8	94.0	(4.2)	V	D/N
14 Feb 1901	SE MO/NE AR	36.0	90.0	(4.2)	IV	N
14 Sep 1901	Memphis, (SW) TN/NW MS	35.1	90.0	(3.4)	III	D/N
24 Jan 1902	St. Louis, (EC) MO/SW IL	38.6	90.2	(4.7)	VI	D/N
10 Mar 1902	Hagerstown, (EC) IN (2)	39.9	85.2	(3.6)	III-IV	D/N
10 Mar 1902	EC IN	39.9	85.	(3.5)	III-IV	N
29 May 1902	Chattanooga, (SE) TN	35.1	85.3	(4.2)	V	Cn/N
28 Jul 1902	Battlecreek, (NE) NE	42.5	97.5	(4.5)	V-VI	D/N
18 Oct 1902	NW GA/SE TN	35.0	85.3	(4.2)	V	Cn/N
1 Jan 1903	Hagerstown, (EC) IN	39.9	85.2	(3.2)	II-III	D/N
1 Jan 1903	Hagerstown, (EC) IN	39.9	85.2	(3.2)	II-III	D/N
13 Jan 1903	Baldwin, (EC) KS	38.8	95.3	(3.0)	II	D/N
8 Feb 1903	St. Louis, (EC) MO/SW IL	37.8	89.3	(4.8)	VI	Cn/N
17 Mar 1903	Hillsboro, (C) IL	39.1	89.5	(3.6)	III-IV	D/N
20 Sep 1903	Morgantown, (WC) IN	39.4	86.3	(3.8)	IV	D/N
21 Sep 1903	Olney, (SE) IL	38.7	88.1	(3.8)	IV	D/N
4 Oct 1903	SE MO/S IL	37	90	(4.6)	V-VI	D/N
3 Nov 1903	Murphysboro, (SW) IL	37.8	89.3	(3.6)	III-IV	D/N
4 Nov 1903	New Madrid, (SE) MO/S IL	36.9	89.3	(5.3)	VII	Cn/N
4 Mar 1903	New Madrid, (SE) MO/S IL	36.9	89.3	(4.7)	VI	D/N
20 Nov 1903	Morgantown, (WC) IN	39.4	86.3	(3.4)	III	D/N
24 Nov 1903	New Madrid, (SE) MO/NW TN	36.6	89.5	(3.4)	III	D/N
25 Nov 1903	New Madrid, (SE) MO/NW TN	36.6	89.5	(3.2)	II-III	D/N
27 Nov 1903	New Madrid, (SE) MO	36.5	89.5	(4.2)	V	D/N
27 Nov 1903	SE MO	36.5	89.5	(4.2)	V	N
11 Dec 1903	Effingham, (EC) IL	39.1	88.5	(3.0)	II	D/N
4 Mar 1904	Sevier Co, (EC) TN	35.7	83.5	(4.3)	V	I
1 Dec 1904	West Point, (EC) NE	41.8	96.7	(3.4)	III	D/N
13 Mar 1905	Menominee, (NW) MI	45.1	87.6	(4.3)	V	I
13 Apr 1905	Keokuk, (SE) IA	40.4	91.6	(4.0)	V	Cn/N
21 Aug 1905	Sikeston, (SE) MO	36.8	89.6	(5.0)	VI-VII	D/N
22 Aug 1905	Quincy, (WC) IL/NE MO	39.9	91.4	(3.2)	II-III	D/N
8 Jan 1906	Manhattan, (NE) KS	39.3	96.6	(3.0)	VII	D/Dum/N
8 Jan 1906	Manhattan, (NE) KS	39.3	96.6	(3.0)		N
8 Jan 1906	Manhattan, (NE) KS	39.3	96.6	(5.5)	VII-VIII	Cn/N
8 Jan 1906	Manhattan, (NE) KS	39.3	96.6	(3.2)	II-III	D/N
8 Jan 1906	Manhattan, (NE) KS	39.3	96.6	(3.2)	II-III	D/N
14 Jan 1906	Manhattan, (NE) KS	39.3	96.6	(3.2)	II-III	D/N
15 Jan 1906	Manhattan, (NE) KS	39.3	96.6	(3.8)	IV	D/N
19 Jan 1906	Manhattan, (NE) KS	39.3	96.6	(3.4)	III	D/N
23 Jan 1906	Manhattan, (NE) KS	39.3	96.6	(3.4)	III	D/N
23 Jan 1906	Manhattan, (NE) KS	39.3	96.6	(3.4)	III	D/N
23 Feb 1906	Anabel, (NE) MO	39.7	92.3	(3.4)	III	N
6 Mar 1906	Hannibal, (NE) MO	39.7	91.4	(3.8)	IV	N
22 Apr 1906	Milwaukee, (SE) WI	43.0	87.9	(3.0)		N
23 Apr 1906	WC OH	40.7	83.6	(4.2)	V	N
8 May 1906	Shelby Co & Bartholomew Co,(EC) IN	39.5	85.8	(3.6)	III-IV	D/N
9 May 1906	Columbus, (EC) IN	39.2	85.9	(3.8)	IV	N
11 May 1906	Petersburg, (SW) IN	38.5	87.2	(3.8)	IV	Cn/N
19 May 1906	Grand Rapids, (SW) MI	42.9	85.7	(3.0)		D/N
21 May 1906	Flora, (SE) IL	38.7	88.4	(4.3)	V	Cn/N
13 Aug 1906	Greencastle, (WC) IN	39.7	86.8	(3.8)	IV	D/N
7 Sep 1906	Owensville, (SW) IN	38.2	87.7	(3.8)	IV	D/N
23 Nov 1906	Anabel, (NE) MO	39.7	92.3	(3.4)	III	N
11 Jan 1907	Arkansas City, (SE) KS	37.1	97.0	(3.8)	IV	D/N
29 Jan 1907	Spencer & Danville, (WC) IN	39.5	86.6	(4.2)	V	D/N
30 Jan 1907	Greenville, (SE) IL	38.9	89.5	(4.2)	V	D/N
4 Jul 1907	Farmington, (EC) MO	37.8	90.4	(3.8)	IV-V	Cn/N
20 Nov 1907	Stephenson Co, (NC) IL	42.3	89.8	(3.7)	IV	D/I
10 Dec 1907	St. Louis, (EC) MO/SW IL	38.6	90.2	(3.8)	IV	N
19 Jul 1908	El Reno & Guthrie, (C) OK	35.7	97.7	(3.4)	III	D/N
28 Sep 1908	New Madrid, (SE) MO	36.6	89.6	(4.0)	IV	Cn/N
27 Oct 1908	Cairo, (S) IL	37.0	89.2	(4.0)	IV-V	Cn/N
12 Nov 1908	Sedalia, (WC) MO	38.7	93.2	(3.8)	IV	D/N
28 Nov 1908	NC IL	42.2	89.8	(3.8)	IV	N
27 Dec 1908	SE MO	37.0	89.0	(4.4)	IV	N
31 Dec 1908	Blandville, (SW) KY	37.0	88.9	(3.4)	IV	D/N
26 Jan 1909	Plainview, (NE) NE	42.3	97.8	(4.0)	IV-V	D/N
26 May 1909	Aurora & Bloomington, (N) IL/S WI	42.5	89.0	(5.3)	VII	D/N
18 Jul 1909	Springfield & Havana, (C) IL	40.2	90.0	(5.3)	VII	D/N
16 Aug 1909	Waterloo, (SW) IL	38.3	90.1	(4.3)	IV	N
22 Sep 1909	Ohio Valley, (SC) IN	38.7	86.5	(4.2)	V	Cn/N
27 Sep 1909	Terre Haute, (SW) IN (2)	39.5	87.4	(5.3)	VII	Cn/D/N
8 Oct 1909	NW GA	35.	85.		IV-V	V
22 Oct 1909	Ironton, (SE) MO	37.6	90.6	(3.8)	IV	N
22 Oct 1909	Sterling, (NC) IL	41.8	89.7	(4.0)	IV-V	D/N
22 Oct 1909	Scott, (NC) KY	38.9	84.5	(3.0)		D/N
23 Oct 1909	Charleston, (SE) MO	37.0	89.5	(4.6)	V	Cn/N
1910	C OK	35.5	98.0		Felt	O
26 Feb 1910	Columbus, (EC) NE	41.4	97.4	(4.0)	IV-V	CI/N
28 Feb 1911	Kenwood Springs, (EC) MO/SW IL (2)	38.7	90.3	(3.8)	IV	D/N
2 Jun 1911	Huron, (SE) SD	44.2	98.2	(4.5)	V	N/I
29 Jul 1911	Chicago, (NE) IL	41.8	87.6	(3.2)	IV-V	D/N
2 Jan 1912	Aurora/Morris/Yorkville, (NE) IL	41.5	88.5	(4.7)	VI	D/N
25 Sep 1912	Rockford, (NC) IL	42.3	89.1	(3.6)	III-IV	D/N

DATE	LOCALITY	N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)	INFO SOURCE
13 Mar 1913	Calhoun, (NW) GA	34-1/2	85		IV	V
28 Mar 1913	Knoxville, (EC) TN	36.2	83.7	(5.3)	VII	Cn/N
17 Apr 1913	Monroe Co, (SE) TN	35.3	84.2	(4.3)	V	I
2 May 1913	Madisonville, (EC) TN	35.5	84.4		III-IV	V
9 Jun 1913	Humboldt, (WC) TN/NE AR	35.8	88.9	(3.9)	III	D/N
3 Aug 1913	Knoxville, (EC) TN	36.0	84.0	(4.0)	IV	V
16 Oct 1913	Sterling, (NC) IL	41.8	89.7	(3.6)	III-IV	D/N
11 Nov 1913	Louisville, (NC) KY/SC IN	38.2	85.8	(3.8)	IV	D/N
1914	Anna, (WC) OH	40.4	84.2	(3.4)	III	D/N
23 Jan 1914	Sweetwater, (EC) TN	35.6	84.5	(4.2)	V	N/V
7 Oct 1914	Madison, (SC) WI	43.1	89.4	(3.8)	IV	D/N
5 Feb 1915	Harrisburg, (SW) IL	37.7	88.6	(3.8)	IV	D/N
18 Feb 1915	Mound City, (S) IL/SW KY/SE MO	37.1	89.2	(3.8)	IV	D/N
15 Apr 1915	Olney, (SE) IL	38.7	88.1	(3.8)	II-III	D/N
28 Apr 1915	New Madrid, (SE) MO/NW TN	36.5	89.5	(4.0)	IV-V	D/N
8 Oct 1915	Muskogee, (EC) OK	35.7	95.3	(3.4)	III	D/N
26 Oct 1915	Mayfield (SW) KY	36.7	88.6	(4.2)	V	Cn/N
8 Nov 1915	Rogers Co, (NE) OK	36.2	95.8		Felt	O
7 Dec 1915	Mouth of Ohio River, (S) IL	36.7	89.1	(4.6)	V-VI	CI/N
7 Jan 1916	Worthington, (SW) IN	39.1	87.0	(3.6)	III	D/N
17 Feb 1916	New Burnside, (SW) IL	37.6	88.8	(3.4)	III	N
21 May 1916	New Madrid, (SE) MO/NW TN (2)	36.6	89.5	(4.1)	IV	D/N
31 May 1916	Madison, (SC) WI	43.1	89.3	(3.0)	II	D/N
24 Aug 1916	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.8)	IV	D/N
19 Oct 1916	Mayfield, (SW) KY	36.7	88.6	(3.4)	III	D/N
18 Dec 1916	Hickman, (SW) KY	36.6	89.2	(4.5)	V-VI	D/N
25 Jan 1917	Jefferson, (EC) TN (2)	36.1	83.5	(3.2)	III	V/N
25 Jan 1917	Williamson Co, (C) TN	35.9	86.8	(2.5)	II	I
26 Jan 1917	Jefferson & Talbot, (EC) TN	36.1	83.5	(3.2)	III	V/D/N
27 Jan 1917	Jefferson City, (EC) TN	36.1	83.5	(3.2)	II-III	V
4 Mar 1917	Knoxville, (EC) TN	36.0	84.0		III	V
25 Mar 1917	Talbot, (EC) TN	36.1	83.5		III-IV	V
26 Mar 1917	Talbot, (EC) TN	36.1	83.5		III	V
27 Mar 1917	Jefferson City, (EC) TN	36.1	83.5		III-IV	V
9 Apr 1917	DeSoto, (EC) MO/SW IL	38.1	90.2	(5.0)	VI	D/N
9 Apr 1917	SW IL/EC MO	38.1	90.2	(3.8)	IV	N
8 May 1917	Hendrickson, (SE) MO	36.8	90.4	(3.9)	III-IV	D/N
3 May 1917	SE MO	36.8	90.4	(3.4)	III	N
9 Jun 1917	New Madrid, (SE) MO/Cairo, (SW) IL	36.8	90.4	(4.3)	IV	D/N
1918	Yukon, (C) OK	35.5	97.7	(3.0)	III-IV	D/N
16 Jan 1918	Knoxville, (EC) TN	35.9	83.9	(4.2)	V	N/V
17 Feb 1918	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.8)	III	N
22 Feb 1918	Morrice, (SE) MI	42.8	84.2	(3.0)	IV	D/N
21 Jun 1918	Lenoir City, (EC) TN	36.1	84.1	(4.2)	V	CI/N
1 Jul 1918	Hannibal, (NE) MO	39.7	91.4	(3.8)	IV	D/N
10 Sep 1918	El Reno, (C) OK	35.5	98.0	(4.5)	V-VI	D/N
11 Sep 1918	El Reno, (C) OK	35.5	97.9	(4.5)	V-VI	D/N
11 Sep 1918	El Reno, (C) OK	35.5	97.9	(3.2)	II-III	D/N

DATE	LOCALITY	N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)	INFO SOURCE
4 Oct 1918	Lonoke Co, (C) AR	34.7	91.7	(4.4)	V	D/N
13 Oct 1918	Black Rock, (NE) AR (2)	36.1	91.0	(4.2)	V	Cn/D/N
15 Oct 1918	SW TN	35.2	89.2	(4.5)	V	N
10 Feb 1919	Henderson, (WC) KY/SW IN	37.8	87.5	(3.8)	III-IV	D/N
8 Apr 1919	Ravenden, (NE) AR	36.2	91.3	(3.6)	III-IV	D/N
23 May 1919	Hickman, (SW) KY/SE MO	36.6	89.2	(3.9)	III	D/N
24 May 1919	Hickman, (SW) KY/SE MO	36.6	89.2	(3.9)	III	D/N
25 May 1919	Princeton, (SW) IN (2)	38.4	87.5	(4.4)	V	D/N
26 May 1919	Cairo, (SW) IL/SW KY/SE MO	36.6	89.2	(3.8)	III	D/N
26 May 1919	Wichita, (SE) KS	37.7	97.3	(4.2)	IV	D/N
28 May 1919	Hickman, (SW) KY/SE MO	36.6	89.2	(3.8)	III	D/N
28 May 1919	Tiptonville, (NW) TN/SE MO	36.6	89.5	(3.8)	III	D/N
26 Jul 1919	Wichita, (SE) KS	37.7	97.3	(3.4)	III	D/N
26 Jul 1919	Wichita, (SE) KS	37.7	97.3	(3.8)	IV	D/N
3 Nov 1919	Pocahontas, (NE) AR	36.3	91.0	(4.0)	IV-V	D/N
28 Feb 1920	Springfield, (SW) MO	37.2	93.3	(4.3)	IV	D/N
30 Apr 1920	Centralia, (SW) IL	38.6	89.1	(4.0)	IV	D/N
1 May 1920	Mount Vernon, (SW) IL/EC MO	38.5	89.5	(4.3)	IV-V	D/N
1 May 1920	Columbia, (SW) IL	38.5	89.5	(3.0)		N
7 May 1920	NW TN	36.3	88.2	(3.8)	II	N
3 Oct 1920	Harrisonville, (WC) MO	38.6	94.3	(3.8)	III	D/N
24 Dec 1920	Rockwood, (NC) TN	36.	85.	(4.2)	V	CI/N
9 Jan 1921	Tiptonville, (NW) TN/SE MO	36.4	89.5	(3.8)	IV	N
27 Feb 1921	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.8)	III	N
14 Mar 1921	Crawfordsville, (WC) IN/EC IL	39.5	87.5	(4.4)	IV	D/N
16 Mar 1921	Sioux Falls, (SE) SD	43.5	96.7	(3.6)	III-IV	D/N
31 Mar 1921	Mt. Vernon, (SW) IN/WC KY	37.9	87.8	(3.8)	IV	D/N
2 Sep 1921	Statesville, (C) TN	36.0	86.1	(3.0)	III	I
2 Sep 1921	NC TN	36.2	86.3	(3.4)	III	N
8 Sep 1921	Waterloo, (SW) IL	38.3	90.1	(4.0)	IV	D/N
8 Sep 1921	Waterloo, (SW) IL	38.3	90.1	(3.0)		N
21 Sep 1921	C TN	36.0	86.1	(3.4)	III	N
23 Sep 1921	White Lake, (SE) SD	43.7	98.7	(3.8)	IV	N
1 Oct 1921	Harrisburg, (SW) IL	37.7	88.6	(4.0)	IV	D/N
9 Oct 1921	Waterloo, (SW) IL	38.3	90.1	(3.8)	III	D/N
9 Oct 1921	Waterloo, (SW) IL	38.3	90.1	(3.4)	III	D/N
15 Dec 1921	EC TN	35.8	84.6	(4.2)	V	N
10 Jan 1922	Mt. Vernon, (SW) IN/WC KY	37.9	87.8	(4.2)	IV-V	D/N
22 Mar 1922	S IL/SW KY	37.3	88.9	(4.2)	V	N
22 Mar 1922	S IL	37.3	88.9	(4.6)	V	N
23 Mar 1922	Blandville, (SW) KY	37.0	88.9	(4.3)	IV	N
28 Mar 1922	Poplar Bluff, (SE) MO	36.7	90.4	(4.0)	III	N
29 Mar 1922	Farmington, (C) TN	35.5	86.7	(3.8)	IV	N/V
30 Mar 1922	Memphis, (SW) TN/SE MO/S IL	36.1	89.6	(4.2)	IV-V	D/N
10 Apr 1922	Monmouth, (WC) IL	40.9	90.6	(3.0)	II	N
7 Jul 1922	Fond du Lac, (EC) WI	43.8	88.5	(4.2)	V	N
26 Nov 1922	El Dorado, (SW) IL	37.8	88.5	(5.0)	VI-VII	D/N
3 Mar 1923	Greenville, (SE) IL	38.9	89.4	(3.9)	III-IV	D/N

DATE	LOCALITY	N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)	INFO SOURCE
27 Mar 1923	Wayatte, (NW) MS	34.6	89.7	(3.9)	III-IV	D/N
6 May 1923	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.9)	III-IV	D/N
15 May 1923	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.8)	III-IV	D/N
10 Sep 1923	Tekamah, (EC) NE	41.7	96.2	(3.6)	III-IV	D/N
28 Oct 1923	Marked Tree, (NE) AR	35.5	90.4	(5.3)	VII	Cn/N
9 Nov 1923	Tallula, (C) IL	40.0	89.9	(4.2)	V	D/N
26 Nov 1923	Marked Tree, (NE) AR	35.5	90.4	(4.1)	IV	D/N
28 Nov 1923	Calhoun, (WC) KY	37.5	87.3	(3.4)	III	D/N
29 Nov 1923	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.8)	IV	D/N
31 Dec 1923	Marked Tree, (NE) AR/SW KY	35.4	90.3	(4.6)	V	D/N
2 Apr 1924	Paducah, (SW) KY/S IL	37.1	88.6	(3.8)	IV	D/N
2 Jun 1924	Cleveland, (NE) OK	36.3	96.5	(3.4)	III	D/N
6 Jun 1924	Tiptonville, (NW) TN/SE MO	36.4	89.5	(4.2)	IV-V	D/N
26 Jan 1925	Waterloo, (NC) IA/EC IA	42.5	92.4	(3.2)	II	N
27 Jan 1925	Evening Shade, (NC) AR	36.2	91.7	(3.8)	III	D/N
3 Mar 1925	Evanston, (NE) IL	42.1	87.7	(3.2)	II-III	D/N
26 Mar 1925	SW OH	39.5	83.9	(4.2)	V	Cn/N
4 Apr 1925	Cincinnati, (SW) OH/NC KY	39.1	84.5	(3.0)		D/N
26 Apr 1925	Princeton, (SW) IN/WC KY	38.3	87.6	(5.0)	VI-VII	D/N
13 May 1925	Mayfield, (SW) KY	36.7	88.6	(3.8)	IV-V	D/N
8 Jul 1925	Harrison & Alpena, (NC) AR	36.2	93.2	(3.8)	IV	D/N
13 Jul 1925	Edwardsville, (SW) IL	38.8	90.0	(4.2)	V	D/N
25 Aug 1925	Yankton, (SE) SD/NE NE	42.8	97.4	(3.8)	IV	D/N
2 Sep 1925	Henderson, (WC) KY	(2) 37.8	87.5	(4.6)	VI	D/N
20 Sep 1925	Henderson, (WC) KY/SW IN	37.8	87.5	(4.1)	IV	D/N
Oct 1925	Anna, (WC) OH	40.4	84.2	(3.4)	III	N
20 Jan 1926	EC OK	35.6	94.9	(4.2)	V	N
22 Mar 1926	Harrisburg, (SW) IL	37.8	88.6	(4.0)	IV	D/N
27 Apr 1926	Kenton, (NW) TN	36.2	89.6	(4.0)	IV	D/N
20 Jun 1926	EC OK	35.6	94.9	(4.2)	V	N
5 Oct 1926	Princeton, (SW) IN	38.3	87.6	(3.4)	III	D/N
26 Oct 1926	SW IN	38.3	87.6	(4.0)	IV	N
27 Oct 1926	Poplar Bluff, (SE) MO	(2) 36.7	90.4	(4.0)	IV	D/N
28 Oct 1926	Toledo, (NW) OH	(2) 41.7	83.6	(3.4)	III	D/N
28 Oct 1926	NW OH	41.7	83.6	(3.5)	IV	N
13 Dec 1926	Parma, (SE) MO	36.7	89.4	(3.8)	III	D/N
17 Dec 1926	Tiptonville, (NW) TN/SE MO	36.4	89.5	(4.0)	IV	D/N
7 Jan 1927	McPherson, (C) KS	38.3	97.7	(4.2)	V	D/N
10 Jan 1927	Scottsboro, (NE) AL	34.7	86.0	(4.2)	V	N/D
31 Jan 1927	Jackson, (SE) MO	37.4	89.7	(4.0)	IV	D/N
3 Feb 1927	Poplar Bluff, (SE) MO	36.7	90.4	(3.8)	IV	N
18 Mar 1927	White Cloud, (NE) KS	39.9	95.3	(4.2)	VI	Duw/N
18 Apr 1927	Ridgely, (NW) TN/SE MO	36.3	89.5	(4.0)	IV	D/N
7 May 1927	Jonesboro, (NE) AR/W TN	35.7	90.6	(5.3)	VII	Cn/N
7 May 1927	Obion Co, (NW) TN	36.5	89.0	(5.7)	VII	I
16 Jun 1927	NE AL	34.7	86.0	(4.2)	V	N
13 Aug 1927	Tiptonville, (NW) TN/SE MO	36.4	89.5	(4.4)	V	D/N
6 Oct 1927	Chattanooga, (SE) TN	35.0	85.3	(4.2)	V	N/V

DATE	LOCALITY	N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)	INFO SOURCE
14 Oct 1927	Ord, (C) NE	41.6	98.9	(3.8)	IV	D/N
23 Jan 1928	Mount Carroll, (NW) IL	42.0	90.0	(3.8)	IV	D/N
6 Mar 1928	Columbia & Franklin, (C) TN	35.6	87.0	(3.4)	II-III	D/N/V
17 Mar 1928	St. Louis, (EC) MO/SW IL	38.6	90.2	(3.3)	II	D/N
15 Apr 1928	New Madrid, (SE) MO/NW TN	36.6	89.5	(3.8)	IV	D/N
15 Apr 1928	Cape Girardeau, (SE) MO	37.3	89.5	(3.8)	IV	Cc/N
23 Apr 1928	Hickman, (SW) KY/NW TN	36.5	89.2	(3.8)	IV	D/N
31 May 1928	New Madrid, (SE) MO/NW TN	36.6	89.5	(3.8)	IV	N
27 Oct 1928	Jackson Center, (WC) OH	40.4	84.1	(3.4)	III	D/N
8 Nov 1928	Beloit, (NC) KS	39.5	98.1	(3.8)	IV	N/DuW
10 Nov 1928	Black Rock, (NE) AR	36.1	91.1	(3.8)	IV	D/N
25 Dec 1928	Black Rock, (NE) AR	36.1	91.1	(3.8)	IV	Cc/N
14 Feb 1929	Princeton, (SW) IN	38.3	87.6	(3.8)	IV	Cc/N
26 Feb 1929	Arcadia, (SE) MO	37.6	90.6	(3.8)	IV	Cc/N
8 Mar 1929	Bellefontaine, (WC) OH	40.4	84.2	(4.2)	V	Cn/N
12 May 1929	Tiptonville, (NW) TN	36.4	89.5	(3.8)	III	Cc/N
23 Sep 1929	Manhattan, (NE) KS	39.0	96.6	(4.0)	V	CI/N
23 Sep 1929	Manhattan, (NE) KS	39.0	96.6	(4.2)	V	Cc/N
6 Oct 1929	Yankton, (SE) SD	42.8	97.4	(4.2)	V	Cc/N
21 Oct 1929	Junction City & Manhattan, (NE) KS	39.2	96.5	(4.2)	V	D/N
23 Oct 1929	Junction City, (NE) KS	39.0	96.8	(3.2)	II-III	D/N
7 Dec 1929	Manhattan, (NE) KS	39.2	96.6	(4.2)	V	D/N
27 Dec 1929	El Reno, (C) OK	35.5	97.9	(4.7)	VI	Cn/N
2 Jan 1930	Ripley, (WC) TN	35.7	89.5	(3.0)	II	D/N
26 Jan 1930	Black Rock, (NE) AR	36.1	91.1	(3.8)	IV	Cc/N
18 Feb 1930	Marked Tree, (NE) AR	35.5	90.4	(3.4)	III	Cc/N
25 Feb 1930	Cairo, (S) IL	37.0	90.2	(3.6)	III-IV	Cc/N
27 Mar 1930	Memphis, (SW) TN	35.1	90.1	(3.8)	IV	Cc/N
2 Apr 1930	Caruthersville, (SE) MO	36.1	89.7	(3.8)	IV	Cc/N
28 May 1930	Hannibal, (NE) MO	39.7	91.4	(3.4)	III	Cc/N
26 Jun 1930	Lima & Bellefontaine, (WC) OH	40-1/2	84	(3.8)	IV	D/N
27 Jun 1930	Sidney & Lima, (WC) OH	40.5	84.0	(3.8)	IV	D/N
8 Aug 1930	Hannibal, (NE) MO	39.7	91.4	(3.8)	IV	Cc/N
13 Aug 1930	New Madrid, (SE) MO/NW TN	36.6	89.5	(3.0)	II	N
29 Aug 1930	Blandville & Barlow, (SW) KY/S IL	37.0	89.1	(4.0)	IV	Cc/N
30 Aug 1930	Lenoir City, (EC) TN	35.9	84.4	(3.0)	V	N/V
1 Sep 1930	Hickman,(SW) KY/Marston,(SE) MO	36.6	89.4	(4.2)	V	Cc/D/N
3 Sep 1930	Blandville, (SW) KY	37.0	88.9	(3.4)	III	D/N
3 Sep 1930	Blandville, (SW) KY	37.0	88.9	(3.4)	III	D/N
29 Sep 1930	Anna & Sidney, (WC) OH	40.4	84.2	(3.4)	III	D/N
30 Sep 1930	Anna, (WC) OH	40.3	84.3	(5.3)	VII	Cn/N
Oct 1930	Anna, (WC) OH	40.4	84.2	(3.6)	III-IV	D/N
16 Oct 1930	Knoxville, (EC) TN	36.0	83.9	(4.2)	V	N/V
23 Dec 1930	Fern Glen & St. Louis, (EC) MO	36.5	90.7	(3.8)	IV	Cc/D/N
5 Jan 1931	Elliston, (SW) IN	39.0	87.0	(4.2)	V	Cn/N
17 Jan 1931	Whitelake, (SE) SD	43.7	98.7	(3.8)	IV	D/N
21 Mar 1931	Sidney & Jackson Center, (WC) OH	40.4	84.2	(3.4)	III	D/N
31 Mar 1931	Jackson Center, (WC) OH	40.4	84.0	(3.4)	III	D/N

DATE	LOCALITY	N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)	INFO SOURCE
1 Apr 1931	Hopkinsville, (SW) KY/SC IL	36.9	88.3	(3.8)	III	D/N
6 Apr 1931	Berkley & Bardwell, (SW) KY	36.8	89.0	(3.8)	IV	Cc/D/N
10 Jun 1931	Malinta, (NW) OH	41.3	84.0	(4.2)	V	D/N
18 Jul 1931	New Madrid, (SE) MO/NE TN	36.6	89.5	(3.8)	IV	D/Cc/N
9 Aug 1931	Turner & Kansas City, (NE) KS	39.1	94.7	(4.0)	IV-V	D/Cc/N
9 Aug 1931	Turner & Kansas City, (NE) KS	39.1	94.7	(3.0)	V-VI	N/DuW
9 Aug 1931	Turner & Kansas City, (NE) KS	39.1	94.7	(3.0)	V-VI	N/DuW
20 Sep 1931	Anna, (WC) OH	40.4	84.2	(5.3)	VII	Cn/N
8 Oct 1931	Anna, (WC) OH	40.4	84.2	(3.4)	III	D/N
18 Oct 1931	Madison, (SC) WI	43.1	89.4	(3.8)	III	D/N
22 Nov 1931	Blytheville, (NE) AR/SE MO	36.0	90.2	(3.6)	III	N
27 Nov 1931	Nashville, (C) TN	36.2	86.8	(3.4)	III	N/V
10 Dec 1931	Blytheville, (NE) AR	35.9	89.9	(3.8)	IV	Cc/N
17 Dec 1931	St. Louis, (EC) MO	38.6	90.2	(3.0)	II	D/N
31 Dec 1931	Petersburg, (SW) IN	38.5	87.2	(3.0)	II	N
22 Feb 1933	Sidney, (WC) OH	40.3	84.2	(3.8)	IV	Cc/N
11 Mar 1933	Poplar Bluff, (SE) MO	36.7	90.4	(3.8)	IV	Cc/N
11 Mar 1933	Poplar Bluff, (SE) MO	36.7	90.4	(3.8)	IV	N
28 May 1933	Maysville, (NE) KY	38.6	83.7	(4.2)	V	Cn/N
13 Jul 1933	St. Mary's, (SE) MO	37.9	89.9	(3.4)	III	Cc/N
3 Aug 1933	St. Mary's, (SE) MO	37.9	89.9	(3.8)	IV	Cc/N
19 Aug 1933	El Reno, (C) OK	35.5	98.0	(4.7)	VI	Cc/N
24 Oct 1933	Cape Girardeau, (SE) MO/S IL	37.3	89.5	(3.4)	III	D/N
16 Nov 1933	Grover, (EC) MO	38.6	90.6	(3.8)	IV	Cc/N
6 Dec 1933	Stoughton, (SE) WI	42.9	89.2	(4.2)	IV	Cc/N
9 Dec 1933	Manila, (NE) AR	35.6	90.2	(4.2)	VI	Cn/N
17 Apr 1934	St. Mary's, (SE) MO/SW IL	37.9	89.9	(3.4)	III	D/N
11 May 1934	North Loup, (EC) NE	41.5	98.7	(3.8)	IV	D/N
15 May 1934	St. Mary's, (SE) MO/SW IL	37.9	89.9	(3.6)	III-IV	D/N
2 Jul 1934	Raleigh & Memphis, (SW) TN	35.2	90.0	(3.8)	IV	D/N
19 Aug 1934	Rodney, (SE) MO	36.9	89.2	(4.7)	VI	CI/N
19 Aug 1934	Cairo, (S) IL/Wickliffe, (SW) KY	37.0	89.2	(3.2)	II-III	D/N
29 Oct 1934	Hartsville, (SE) IL	37.5	88.5	(3.8)	IV	D/N
7 Nov 1934	Johnson, (SE) NE	40	96		III	Cc/D
12 Nov 1934	Rock Island, (NW) IL	41.5	90.5	(4.7)	VI	Cn/N
1 Jan 1935	Hayesville, (SW) NC	35.1	83.6	(4.3)	V	I
5 Jan 1935	Davenport, (EC) IA/NW IL	41.5	90.6	(4.2)	IV	D/N
5 Jan 1935	NW IL/EC IA	41.5	90.6	(3.4)	III	Cc/N
30 Jan 1935	Pawnee, (NC) MO/SC IA	40.5	94.0	(3.4)	III	N/D
26 Feb 1935	Burlington, (SE) IA	40.8	91.1	(3.4)	III	D/N
1 Mar 1935	Tecumseh, (SE) NE	40.3	96.2	(5.3)	VII	CI/N
1 Mar 1935	Tecumseh, (SE) NE	40.3	96.2	(3.0)		D/N
22 Mar 1935	SE NE	40.3	96.1	(3.8)	IV	N
23 Jul 1935	Tiptonville, (NW) TN	36.4	89.5	(3.8)	IV	Cc/N
29 Oct 1935	Pike Co, (WC) IL	39.6	90.8	(3.0)		D/N
1 Nov 1935	Egan, (SE) SD	44.0	96.6	(3.4)	III	N
24 Nov 1935	Payne Co, (NC) OK	36.2	97.0		Felt	D
. Jan 1936	Murphy, (SW) NC/Blue Ridge, (N) GA	35.0	84.2	(3.0)	III	Cc/V/I

DATE	LOCALITY	N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)	INFO SOURCE
16 Feb 1936	Hayti, (SE) MO/NW TN	36.2	89.7	(3.8)	IV	Cc/N
2 Aug 1936	Cairo, (SC) IL/NW TN/SW KY	36.7	89.0	(3.8)	III	D/N
8 Oct 1936	Cincinnati & Middletown, (SW) OH	39.3	84.4	(3.4)	III	D/N
20 Oct 1936	New Madrid, (SE) MO/NW TN	36.6	89.6	(3.0)	II	D/N
31 Oct 1936	NW TN/SE MO	36.6	89.6	(3.0)	II	N
23 Nov 1936	Butler Co, (SE) MO	36.6	90.6	(3.0)	II	D/N
25 Nov 1936	SE MO	36.6	90.6	(3.0)	II	N
20 Dec 1936	Cape Girardeau, (SE) MO/S IL	37.3	89.5	(3.0)	II	D/N
25 Dec 1936	Cincinnati, (SW) OH/NC KY	39.1	84.5	(3.4)	III	D/N
25 Dec 1936	Cincinnati, (SW) OH/NC KY	39.1	84.5	(3.4)	III	D/N
30 Jan 1937	Caruthersville, (SE) MO	36.2	89.7	(3.8)	IV	Cc/N
2 Mar 1937	Anna & Sidney, (WC) OH (swarm)	40.4	84.2	(5.3)	VII	Cn/N
3 Mar 1937	Anna, (WC) OH	40.7	84.0	(4.2)	V	N
3 Mar 1937	Anna, (WC) OH	40.7	84.0	(3.4)	III	N
9 Mar 1937	Anna & Sidney, (WC) OH (main)	40.4	84.2	(5.3)	VII-VIII	CI/N
18 Mar 1937	Perryville, (SE) MO	37.7	89.9	(3.2)	II-III	D/N
23 Apr 1937	Anna, (WC) OH	40.7	84.0	(3.4)	III	D/N
27 Apr 1937	Anna, (WC) OH	40.7	84.0	(3.4)	III	D/N
2 May 1937	Anna, (WC) OH	40.7	84.0	(3.8)	IV	D/N
16 May 1937	Jonesboro, (NE) AR	36.1	90.6	(4.4)	IV-V	D/N
8 Jun 1937	Tecumseh, (C) OK	35.3	96.9	(3.8)	IV	D/N
23 Jun 1937	Tiptonville, (NW) TN	36.4	89.5	(3.4)	III	Cc/N
29 Jun 1937	Peoria, (C) IL	40.7	89.6	(3.0)	II	D/N
5 Aug 1937	St. Louis, (EC) MO/NW IL	38.7	90.1	(3.4)	III	D/N
5 Oct 1937	New Madrid, (SE) MO	36.6	89.5	(3.4)	III	Cc/N
16 Oct 1937	Cincinnati, (SW) OH	39.1	84.5	(3.4)	III	Cc/N
17 Nov 1937	Centralia, (SW) IL	38.6	89.1	(4.4)	V	D/N
2 Jan 1938	EC SD	44.5	98.2	(4.0)	IV-V	D/N
16 Jan 1938	Perryville, (SE) MO	37.7	89.9	(3.4)	III	N
12 Feb 1938	NW IN	41.6	87.0	(4.2)	V	N
10 Mar 1938	New Madrid, (SE) MO/NW TN	36.6	89.6	(3.0)	II	D/N
31 Mar 1938	Knoxville, (EC) TN/Murphy, (SW) NC	35.5	83.5	(3.7)	III-IV	V/I
17 Jun 1938	Luxora & Burdette, (NE) AR/WC TN	35.8	89.9	(3.4)	III	D/N
17 Sep 1938	NE AR	35.5	90.3	(3.0)		N
17 Sep 1938	NE AR	35.5	90.3	(4.6)	IV-V	Cn/N
18 Sep 1938	Marked Tree, (NE) AR	35.5	90.3	(3.2)	II-III	D/N
16 Sep 1938	Marked Tree, (NE) AR	35.5	90.3	(3.2)	II-III	D/N
26 Sep 1938	Malden, (SE) MO	36.5	89.9	(3.4)	III	D/N
11 Oct 1938	Sioux Falls, (SE) SD	43.5	96.7	(4.2)	V	Cn/N
4 Nov 1938	SE SD/C NE (2)	43.2	98.9	(3.8)	IV	D/N
7 Nov 1938	Dubuque, (EC) IA	42.5	90.7	(3.0)		D/N
8 Nov 1938	Dubuque, (EC) IA	42.5	90.7	(3.0)		D/N
8 Nov 1938	EC IA	42.5	90.7	(3.0)		D/N
18 Mar 1939	Jackson Center, (WC) OH	40.4	84.0	(3.0)	II	D/N
18 Mar 1939	WC OH	40.4	84.0	(3.6)	III-IV	N
15 Apr 1939	East Prairie & New Madrid, (SE) MO	36.8	89.4	(3.4)	III	Cc/N
1 Jun 1939	Holdenville, (EC) OK	35.0	96.4	(4.3)	IV	D/N
10 Jun 1939	Fairfax, (SE) SD/NC NE	43.0	98.9	(3.8)	IV	D/N

DATE	LOCALITY	N LAT	W LONG	MAG (m) b	INTENSITY (max. MM)	INFO SOURCE
17 Jun 1939	Anna, (WC) OH	40.3	84.0	(3.8)	IV	Cc/N
24 Jun 1939	Huntsville, (NC) AL	34.7	86.6	(3.0)	IV	N/V
24 Jun 1939	Huntsville, (NC) AL	34.7	86.6	(3.8)	IV	D/N
24 Jun 1939	Huntsville, (NC) AL	34.7	86.6	(3.0)		D/N
9 Jul 1939	Anna, (WC) OH	40.3	84.0	(3.0)	II	Cc/N
19 Sep 1939	Tiptonville, (NW) TN/SE MO	36.4	89.5	(3.4)	III	D/N
23 Nov 1939	Griggs, (SW) IL	38.2	90.1	(4.9)	V	Cn/N
24 Nov 1939	Davenport, (EC) IA	41.6	90.6	(3.2)	II-III	D/N
8 Jan 1940	Louisville, (NC) KY/SC IN	38.3	85.8	(3.4)	III	D/N
4 Feb 1940	Cape Gir. & Commerce, (SE) MO/S IL	37.2	89.5	(3.4)	III	D/N
14 Feb 1940	Blytheville, (NE) AR/WC TN	35.9	89.8	(3.4)	III	D/N
27 May 1940	Louisville, (NC) KY/SC IN	38.2	85.8	(3.2)	II-III	D/N
31 May 1940	Paducah, (SW) KY	37.1	88.6	(4.2)	V	Cc/N
19 Sep 1940	New Madrid Region, (SE) MO	36.5	89.6	(3.2)	II-III	D/N
10 Oct 1940	New Madrid Region, (SE) MO/SW KY	36.8	89.2	(3.2)	II-III	D/N
19 Oct 1940	Chattanooga & Cleveland, (SE) TN	35.1	85.3		IV	V/Cc
19 Oct 1940	Ringold, (NW) GA	34.7	85.1	(3.7)	IV	I
28 Dec 1940	Evansville, (SW) IN/WC KY	37.9	87.3	(3.6)	III	D/N
Jan 1941	Winfield, (EC) MO	39.0	90.7	(3.0)	III	I
4 Mar 1941	Knoxville, (EC) TN	36.0	83.9	(3.2)	III	N/V
27 Aug 1941	SE MO	36.7	89.7	(3.4)	III	N
8 Sep 1941	Chattanooga, (SE) TN	35.0	85.3	(3.8)	IV	N/V
8 Oct 1941	Blytheville, NE AR/NE TN	36.2	89.7	(4.0)	IV-V	D/N
18 Oct 1941	Bessie, (WC) OK	35.4	99.0	(4.2)	V	D/N
21 Oct 1941	Cairo, (S) IL/Wickliffe, (SW) KY	37.0	89.1	(3.8)	IV	D/N
26 Oct 1941	Cape Girardeau, (SE) MO/NE AR	36.7	89.7	(3.4)	III	D/N
14 Nov 1941	Memphis, (SW) TN	35.1	90.0	(3.8)	IV	Cc/N
15 Nov 1941	Waterloo, (SW) IL/EC MO	38.3	90.2	(3.4)	III	D/N
16 Nov 1941	Covington, (WC) IN	35.5	89.7	(4.7)	VI	Cn/N
22 Nov 1941	Cape Girardeau, (SE) MO/S IL	37.3	89.5	(3.2)	II-III	D/N
Jan-Apr1942	Winfield, (EC) MO	38.6	90.4		III	D
14 Jan 1942	St. Louis, (EC) MO/SW IL	38.4	90.3	(3.4)	III	D/N
23 Jan 1942	EC MO	38.6	90.4	(3.0)	II	N
29 Jan 1942	St. Louis, (EC) MO/SW IL	38.3	90.4	(3.0)		D/N
30 Jan 1942	St. Louis, (EC) MO	38.7	90.3	(3.0)		D/N
1 Mar 1942	Buda & Kewanee, (NC) IL	41.2	89.7	(4.0)	IV-V	Cc/CI/N
29 Mar 1942	Harrisburg, (SW) IL	37.7	88.6	(3.8)	IV	D/N
11 Jun 1942	Enid, (NC) OK	36.4	97.9	(3.4)	III	Cc/N
31 Aug 1942	Cairo, (S) IL	37.0	89.2	(3.8)	IV	Cc/N
17 Nov 1942	SW IL/EC MO	38.5	90.2	(3.0)		N
17 Nov 1942	East St. Louis, (SW) IL	38.6	90.2	(3.8)	IV	Cc/N
30 Nov 1942	New Madrid Region, (SE) MO	35.8	89.7	(3.4)	III	N
27 Dec 1942	Maplewood, (EC) MO	38.6	90.3	(3.2)	II-III	D/N
13 Apr 1943	Louisville, (NC) KY/SC IN	38.3	85.8	(3.8)	IV	D/N
18 Apr 1943	Waterloo, (SW) IL/SC IN	36.3	85.8	(3.8)	IV	D/N
20 May 1943	West Alton, (EC) MO/SW IL	38.9	90.2	(3.0)	II	D/N
24 May 1943	West Alton, (EC) MO/SW IL	38.9	90.2	(3.0)	II	D/N
5 Jun 1943	Webster Groves, (EC) MO	38.6	90.4	(3.6)	III-IV	Cc/N
7 Jan 1944	Oakridge, (SE) MO	37.5	89.7	(3.8)	IV	D/N
16 Mar 1944	Elgin, (NE) IL	42.0	88.3	(3.4)	IV	D/N
25 Sep 1944	Ste.Genevieve & St. Louis,(EC) MO	37.9	90.0	(4.4)	IV	Cc/D/N
13 Nov 1944	Botkins & Anna, (WC) OH	40.4	84.4	(4.3)	III	D/N
23 Dec 1944	Caruthersville, (SE) MO/NW TN	36.2	89.7	(3.8)	IV	D/N
15 Jan 1945	Farmington, (EC) MO	37.8	90.2	(3.3)	IV	D/N
27 Mar 1945	St. Louis, (EC) MO	38.6	90.2	(3.4)	III	Cc/N
2 May 1945	Marston, (SE) MO	36.5	89.7	(3.8)	IV	D/N
21 May 1945	St. Louis, (EC) MO	38.6	90.2	(3.8)	IV	Cc/N
13 Jun 1945	Cleveland, (SE) TN	35.2	84.9	(4.3)	V	Cn/V
6 Aug 1945	Union City, (NW) TN	36.1	89.7	(3.4)	III	D/N
6 Aug 1945	Caruthersville, (SE) MO/WC TN	36.1	89.7	(3.4)	III	D/N
23 Sep 1945	Cairo,(S) IL/Hermondale,(SE) MO	36.0	89.8	(3.8)	IV	Cc/D/N
27 Oct 1945	SE MO/NW TN/SW KY	36.5	89.5	(3.4)	III	D/N
10 Nov 1945	Tyndall, (SE) SD	43.0	97.9	(3.8)	IV	D/N
13 Nov 1945	Cairo, (S) IL	37.0	89.2	(4.1)	IV	Cc/N
24 Feb 1946	Centralia, (SW) IL	38.6	89.1	(3.8)	IV	Cc/N
6 Apr 1946	Cleveland, (SE) TN	35.2	84.9	(3.8)	IV	N/V
15 May 1946	Doniphan, (SE) MO	36.6	90.8	(4.2)	III-IV	Cc/N
23 Jul 1946	Wessington, (SE) SD	44.1	98.6	(4.7)	VI	Cn/N
7 Oct 1946	French Mills, (SE) MO	37.5	90.6	(4.4)	IV-V	Cc/N
7 Nov 1946	Washington Co, (EC) MO	38.0	90.7	(3.2)	II-III	D/N
16 Jan 1947	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.2)	II-III	D/N
16 Mar 1947	Dundee, (NE) IL	42.1	88.3	(3.8)	IV	D/N
20 Mar 1947	SW KY	37.0	88.4	(4.0)	IV	N
6 May 1947	Milwaukee & Kenosha, (SE) WI	43.0	87.9	(4.0)	IV-V	D/Cc/N
6 Jun 1947	Knoxville, (EC) TN	36.	84.		III	V
29 Jun 1947	St. Louis, (EC) MO	38.4	90.2	(4.7)	VI	D/N
9 Aug 1947	Athens, (SC) MI	42.0	85.0	(4.7)	VI	Cn/N
25 Aug 1947	Bonesteel, (SE) SD/NC NE	43.1	98.9	(3.8)	IV	D/N
1 Dec 1947	Poplar Bluff, (SE) MO	36.7	90.6	(4.2)	IV	Cc/N
15 Dec 1947	Memphis,(SW) TN/Osceola,(NE) AR	35.6	90.	(4.2)	V	Cc/D/N
27 Dec 1947	SE TN/NW GA	35.0	85.3	(3.7)	IV	V/I
5 Jan 1948	Centralia, (SW) IL	38.6	89.1	(4.0)	IV-V	D/N
15 Jan 1948	Lake Mendota, (SC) WI	43.1	89.7	(3.9)	IV	D/N
18 Jan 1948	Toledo, (NW) OH	41.7	83.6	(3.4)	III	D/N
9 Feb 1948	Campbell Co, (NE) TN	36.4	84.1	(4.5)	V-VI	N/V
9 Feb 1948	NE TN	36.4	84.1	(3.4)	III	N
2 Apr 1948	Beechwood & Wichita, (SE) KS (2)	37.7	97.3	(3.8)	IV	Cc/N
20 Apr 1948	Iowa City, (SE) IA	41.7	91.8	(3.8)	IV	Cc/N
13 Jan 1949	Portageville, (SE) MO/SW KY/NE AR	36.4	89.7	(4.2)	V	N
31 Jan 1949	SE MO	36.3	89.7	(4.2)	V	N
7 May 1949	Miller, (EC) SD	44.5	99.0	(3.4)	III	D/N
12 May 1949	Atkinson, (NC) NE	42.5	99.0	(3.8)	IV	D/N
8 Jun 1949	Ste. Genevieve, (EC) MO	38.1	90.3	(3.4)	III	D/N
11 Aug 1949	Clayton, (EC) MO	38.6	90.3	(3.2)	II-III	Cc/N
13 Aug 1949	Caruthersville, (SE) MO	36.1	89.7	(3.4)	III	Cc/N
20 Aug 1949	Defiance, (EC) MO	38.5	90.7	(3.4)	III	Cc/N

DATE	LOCALITY	N LAT	W LONG	MAG (m) b	INTENSITY (max. MM)	INFO SOURCE
8 Feb 1950	Lebanon, (SW) MO	37.7	92.7	(4.2)	V	Cn/N
20 Apr 1950	Dayton, (WC) OH	39.8	84.2	(3.8)	IV	D/N
1 May 1950	Gideon, (SE) MO	36.5	89.9	(3.2)	II-III	D/N
18 Jun 1950	Alcoa, (EC) TN	35.8	84.0	(3.8)	IV	N/V
16 Sep 1950	Mississippi Co, (NE) AR	35.7	89.9	(3.8)	III-IV	Cc/N
19 Sep 1951	Collinsville&Edwardsville, (SW) IL	38.7	89.9	(3.8)	IV	D/N
17 Dec 1951	New Madrid, (SE) MO/NE AR	35.6	90.3	(3.4)	III	D/Cc/N
16 Dec 1951	LePanto, (NE) AR	35.6	90.3	(3.2)	II-III	D/N
7 Jan 1952	Dewitt Co & McClean Co, (EC) IL	40.2	88.5	(3.4)	III	Cc/N
20 Feb 1952	Tiptonville, (NW) TN/SE MO	36.4	89.5	(4.2)	V	Cc/N
9 Apr 1952	El Reno, (C) OK (main)	35.4	97.8	5.5	VII	Cc/N
11 Apr 1952	El Reno, (C) OK	35.4	97.8	(3.2)	II-III	Cc/N
11 Apr 1952	El Reno, (C) OK	35.4	97.8	(3.8)	IV	D/N
15 Apr 1952	El Reno, (C) OK	35.4	97.8	(3.2)	II-III	D/N
16 Apr 1952	El Reno, (C) OK	35.4	97.8	(4.2)	V	Cn/N
16 Apr 1952	C OK	35.4	97.8	(3.8)	IV	N
1 May 1952	C OK (2)	35.4	97.8		Felt	O
28 May 1952	New Madrid, (SE) MO	36.6	89.7	(3.8)	IV	Cc/N
15 Jun 1952	C OK (6)	35.4	97.8		IV	O
16 Jul 1952	Dyersburg, (NW) TN	36.2	89.6	(4.7)	VI	Cn/N
16 Jul 1952	NW TN	36.2	89.6	(3.8)	IV	N
16 Jul 1952	El Reno, (C) OK	35.4	97.8	(3.6)	III-IV	D/N
16 Jul 1952	El Reno, (C) OK	35.4	97.8	(3.6)	IV	D/N
14 Aug 1952	El Reno, (C) OK (after)	35.4	97.8	(3.8)	IV	Cc/N
7 Oct 1952	Wewoka, (EC) OK	35.1	96.5	(3.8)	IV	Cc/N
16 Oct 1952	Dyersburg, (NW) TN	36.2	89.6	(3.8)	IV	D/N
16 Oct 1952	Dyersburg, (NW) TN	36.2	89.6	(3.2)	II-III	D/N
16 Oct 1952	Dyersburg, (NW) TN	36.2	89.6	(3.2)	II-III	D/N
16 Oct 1952	Dyersburg, (NW) TN	36.2	89.6	(3.2)	II-III	D/N
24 Dec 1952	Blytheville, (NE) AR	35.9	89.8	(4.1)	IV	Cc/N
24 Dec 1952	Blytheville, (NE) AR	36.1	90.0	(3.7)	IV	CI/I
25 Dec 1952	Blytheville, (NE) AR	35.9	89.8	(3.0)	II	D/N
28 Dec 1952	Mississippi Co, (SE) MO	36.7	89.6	(3.4)	III	Cc/N
11 Feb 1953	New Madrid, (SE) MO	36.5	89.5	(3.8)	IV	Cc/N
17 Feb 1953	Finley, (NW) TN	36.5	89.5	(3.8)	IV	Cc/N
17 Feb 1953	Finley, (NW) TN/SE MO	36.5	89.5	(3.4)	III	N
18 Feb 1953	Finley, (NW) TN	36.0	89.5	(3.4)	III	Cc/N
16 Mar 1953	Union City, (C) OK	35.4	97.9	(3.4)	III	D/N
17 Mar 1953	Concho, (C) OK	35.6	98.0	(4.2)	V	Cn/N
17 Mar 1953	Concho, (C) OK	35.6	98.0	(4.7)	VI	D/N
6 May 1953	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.4)	III	N
12 May 1953	Lepanto, (NE) AR	35.6	90.3	(3.8)	IV	Cc/N
15 May 1953	Cairo, (S) IL/SW KY/SE MO	37.0	89.2	(3.4)	III	N
6 Jun 1953	Ada, (SE) OK	34.7	96.7	(3.8)	IV	D/N
12 Jun 1953	Toledo, (NW) OH/SC MI	41.7	83.6	(3.8)	IV	D/N
11 Sep 1953	Roxana, (SW) IL	38.8	90.1	(4.7)	III	D/N
10 Nov 1953	Knoxville, (EC) TN	36.0	83.9	(3.8)	IV	N/V
5 Dec 1953	Knoxville, (EC) TN	36.0	84.0			[illegible]
30 Dec 1953	Centralia, (SW) IL	38.6	89.1	(3.8)	IV	Cc/N
1 Jan 1954	Middlesboro, (SE) KY	36.6	83.7	(4.7)	VI	Cn/N
17 Jan 1954	Dyersburg, (NW) TN	36.0	89.4	(3.8)	IV	Cc/N
22 Jan 1954	Athens & Etowah, (SE) TN	35.4	84.6	(4.3)	V	Cn/I
2 Feb 1954	Poplar Bluff, (SE) MO/NE AR	36.7	90.3	(4.4)	VI	Cc/N
11 Apr 1954	Holdenville, (EC) OK	35.0	96.4	(3.8)	IV	Cc/N
12 Apr 1954	Holdenville, (EC) OK	35.0	96.4	(3.8)	IV	D/N
13 Apr 1954	Holdenville, (EC) OK	35.1	96.4	(3.8)	IV	D/N
26 Apr 1954	Memphis, (SW) TN	35.1	90.0	(4.4)	V	Cn/N
9 Aug 1954	Petersburg, (SW) IN	38.5	87.3	(3.8)	IV	Cc/N
12 Jan 1955	Blount Co & Knox Co, (EC) TN	35.8	84.0	(3.8)	IV	N/V
25 Jan 1955	Finley, (NW) TN/NE AR/SE MO	36.0	89.5	(4.7)	VI	Cn/N
25 Jan 1955	Knoxville, (EC) TN	36.0	83.9	(3.8)	IV	N/V
24 Feb 1955	Cotesfield/Ord, (EC) NE	41.3	98.6	(3.8)	IV	D/Cc/N
29 Mar 1955	Finley, (NW) TN	36.0	89.5	(4.7)	VI	Cn/N
9 Apr 1955	Sparta, (SW) IL	38.1	89.9	(4.5)	VI	D/N
11 Apr 1955	Harrisburg, (SW) IL	37.7	88.6	(3.0)	II	Cc/N
29 May 1955	Ewing, (SC) IL	38.1	88.9	(3.4)	III	Cc/N
5 Sep 1955	Finley, (NW) TN	36.0	89.5	(4.2)	V	Cn/N
6 Sep 1955	NW TN	36.0	89.5	(3.4)	III	N
24 Sep 1955	Tiptonville, (NW) TN	36.4	89.5	(3.8)	IV	Cc/N
13 Dec 1955	Dyer Co, (NW) TN	36.0	89.5	(4.2)	V	D/N
13 Dec 1955	Dyer Co, (NW) TN	36.0	89.5	(3.4)	III	D/N
6 Jan 1956	Barber Co, (SC) KS	37.3	98.7	(4.7)	VI	DuW/N
23 Jan 1956	Caruthersville, (SE) MO	36.1	89.7	(3.2)	II-III	Cc/N
27 Jan 1956	Anna/Sidney/Lima/Botkins, (WC) OH	40.4	84.2	(4.2)	V	Cc/N
28 Jan 1956	Covington, (WC) TN/NE AR	35.6	89.6	4.7	VI	D/N
16 Feb 1956	Edmond, (C) OK M_L=3.8	35.4	97.3	4.7	VI	N/Cn
13 Mar 1956	Fulton Co, (WC) IL	40.5	90.4	(3.8)	IV	Cc/N
2 Apr 1956	Antlers, (SE) OK	34.2	95.6	(4.2)	V	E/O
18 Jul 1956	Oostburg, (WC) WI	43.6	87.7	(3.8)	IV	Cc/N
16 Jul 1956	Oostburg, (WC) WI	43.6	87.7	(3.8)	IV	D/N
7 Sep 1956	Knoxville, (EC) TN (2)	35.5	84.0	(5.0)	VI	V/I
9 Sep 1956	College Grove, (C) TN	35.8	86.7	(3.8)	IV	N/V
13 Oct 1956	Racine & Milwaukee, (SE) WI	42.9	87.9	(3.5)	IV	D/N
29 Oct 1956	Caruthersville, (SE) MO	36.1	89.7	(4.2)	V	Cn/N
30 Oct 1956	Catoosa, (NE) OK M_L=4.2	36.2	95.9	4.7	VII	N/O
25 Nov 1956	Wayne Co, (SE) MO	37.1	90.6	(4.7)	VI	Cn/N
8 Jan 1957	Beaver Dam & Waupun, (EC) WI	43.5	88.8	(3.5)	III-IV	D/N
25 Jan 1957	Middlesboro, (SE) KY	36.6	83.7	(4.0)	VI	N/V
26 Mar 1957	Paducah, (SW) KY	37.0	88.4	(3.8)	IV	Cn/N
23 Apr 1957	Birmingham, (NC) AL	34-1/2	86-3/4		VI	V
23 Jun 1957	NC TN	36-1/2	84-1/2	(4.2)	V	CI/N
23 Jul 1957	Ripley, (SW) OH/NE KY	38.7	83.8	(3.4)	III	D/N
17 Aug 1957	Bogota, (NW) TN	36.2	89.5	(3.3)	IV	Cc/N
24 Nov 1957	Hartford, (EC) TN	35-1/2	83-1/2		VI	Cn/V
3 Dec 1957	Mt. Vernon & Mitchell, (SE) SD	43.8	98.2	(3.5)	IV	D/N
26 Jan 1958	Memphis, (SW) TN/SE MO	36.1	89.7	(4.2)	V	Cn/N

DATE	LOCALITY		N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)	INFO SOURCE
27 Jan 1958	Mounds, (S) IL/SW KY/SE MO		37.1	89.2	(4.2)	V	D/N
8 Apr 1958	Troy Co & Obion Co, (NW) TN		36.3	89.2	(4.2)	V	D/Cn/N
26 Apr 1958	Lake Co, (NW) TN		36.4	89.5	(4.2)	IV	Cn/N
19 May 1958	Marked Tree, (NE) AR		35.5	90.4	(3.8)	IV	Cc/N
7 Nov 1958	SE IL/SW IN		38.4	87.9	(4.7)	VI	N
6 Jan 1959	North St. Louis Co, (EC) MO		38.7	90.3	(3.4)	III	D/N
21 Jan 1959	Ridgely, (NW) TN		36.3	89.5	(3.8)	IV	Cc/N
13 Feb 1959	Bogota, (NW) TN		36.1	89.5	(4.2)	V	Cn/N
12 Jun 1959	Tellico Plains, (SE) TN		35.4	84.3	(3.7)	IV	I
15 Jun 1959	Ada & Pontotoc Co, (SE) OK	M_L=2.[illegible]	34.7	96.7	4.2	V	Cn/N/O
17 Jun 1959	Lawton, (SC) OK	M_L=4.8	34.6	98.4	4.7	VI	D/N/O
20 Jul 1959	Blytheville, (NE) AR		35.9	89.8	3.4	III	Cc/N
12 Aug 1959	N AL/SC TN		35.0	87.0	4.7	VI	CI/N
12 Aug 1959	Hanal Green, (NW) AL		35.0	87.0		VI	D
21 Dec 1959	Finley, (NW) TN		36.0	89.5	4.2	V	Cn/N
28 Jan 1960	Dyer Co, (NW) TN		36.0	89.5	4.2	V	Cn/N
18 Mar 1960	Rogers Co, (NE) OK		36.2	95.8		Felt	O
15 Apr 1960	EC TN		35-3/4	84	(4.2)	V	N/V
21 Apr 1960	Lake Co, (NW) TN		36.0	89.5	4.2	V	Cn/N
10 Jan 1961	Pittsburg Co & Latimer Co, (SE) OK		34.9	95.5	4.2	V	Cn/N
26 Apr 1961	SE OK		34.6	95.0	3.8	III	Cc/N
26 Apr 1961	SE OK		34.6	95.0	3.0	III	N/I
26 Apr 1961	SE OK		34.6	95.0	3.0		N
27 Apr 1961	Antlers, (SE) OK		34.9	95.3	4.2	V	E/Cn/N
9 Sep 1961	NE AR/SE MO		36.4	91.3	3.8	IV	N
25 Dec 1961	WC MO/NE KS		39.1	94.6	3.5	IV	D/N
25 Dec 1961	WC MO/NE KS		39.1	94.6	3.8	V	N
2 Feb 1962	New Madrid, (SE) MO	M_S=3.5	35.6	89.6	4.3	VI	D/Cn/N
16 Feb 1962	SW KY		37.0	88.7	3.6	III-IV	N
25 Mar 1962	SE MO/NW TN		36.5	89.5	3.2		N
16 May 1962	Pittsburg Co, (SE) OK	M_L=2.6	35.1	95.4	2.6		O
24 May 1962	SE MO/NW TN		36.5	89.5	3.0		N
1 Jun 1962	EC AR, W TN/NW MS		36.0	90.2	3.2		N
26 Jun 1962	Johnson City, (SW) IL		37.7	88.5	4.4	V	D/N
13 Jul 1962	SE MO		36.9	90.0	3.2	II-III	N
23 Jul 1962	Dyersburg, (NW) TN/SE MO		36.1	89.8	4.2	VI	D/N
1 Sep 1962	Hughes Co, (EC) OK	M_L=2.8	35.2	96.0	2.8		O
3 Mar 1963	Poplar Bluff, (SE) MO	M_S=4.1	36.7	90.0	4.7	VI	Cc/N
13 Mar 1963	Atoka Co, (SE) OK	M_L=3.1	34.6	95.9	3.1		O
31 Mar 1963	SE MO/NW TN		36.5	89.5	3.0		N
6 Apr 1963	SE MO		36.4	89.8	3.1		N
19 Apr 1963	SE MO		36.7	90.1	3.5		N
1 May 1963	SE MO		36.7	89.4	3.1		N
12 Jun 1963	Pontotoc Co, (SE) OK		34.7	96.0	2.6		O
8 Jul 1963	SE MO		37.0	90.5	3.1		N
14 Jul 1963	Grady Co, (C) OK		35.5	97.7	2.6		O
2 Aug 1963	Paducah, (SW) KY/S IL		37.0	88.5	4.4	V	Cc.N
5 Dec 1963	WC KY		37.2	87.0	[illegible]	II-III	N
14 Dec 1963	Beechmont, (SW) KY		37.2	87.1	3.4	III	Cc/N
15 Jan 1964	SE MO		36.8	89.5	3.2		N
25 Jan 1964	SE MO/NW TN		36.5	89.5	3.0		N
18 Feb 1964	N AL/N GA		34.8	85.5	4.2	V	N/V
16 Mar 1964	Caruthersville, (SE) MO		36.2	89.6	3.5	IV	Cc/N
23 May 1964	SE MO		36.5	89.9	3.9	IV-V	N/D
23 May 1964	SE MO		36.5	90.0	3.6	III	N
28 Jul 1964	Knoxville, (EC) TN		36.0	83.9	3.0	II	Cc/N
24 Sep 1964	SE MO		37.1	91.1	3.0		N
28 Sep 1964	SW MN		44.0	96.4	3.4		N
13 Oct 1964	Knoxville, (EC) TN		36.0	83.9	3.2	II-III	N/V
10 Feb 1965	SE MO		36.4	89.7	3.3	III	N
1[illegible] Feb 1965	SW MO		36.9	93.3	3.0		N
6 Mar 1965	Centerville, (SE) MO		37.4	91.1	4.1	III	Cc/N
25 Mar 1965	New Madrid, (SE) MO		36.4	89.5	3.7	III	Cc/N
26 Mar 1965	SE MO/NW TN		36.5	89.5	3.1		N
25 May 1965	NW TN/SE MO		36.1	89.9	3.3		N
1 Jun 1965	NW TN/SE MO		36.5	89.5	3.0		N
8 Jul 1965	NW TN/SE MO		36.5	89.5	3.3		N
13 Aug 1965	SE MO		37.1	89.3	3.0		N
13 Aug 1965	SW IL		37.3	89.5	3.2	IV	CI/N
14 Aug 1965	Tamms, (SW) IL		37.1	89.2	3.8	VII	Cc/N
14 Aug 1965	SE MO		37.4	89.5	3.4	V	N
15 Aug 1965	Tamms & Unity, (S) IL	(2)	37.4	89.5	3.4	V	Cn/N
10 Oct 1965	NC OK		36.1	97.7	3.1		N
20 Oct 1965	SE MO	M_S=4.1	37.5	91.0	4.9	VI	N
3 Nov 1965	SE MO		37.1	91.1	3.0		N
4 Nov 1965	SE MO		37.1	91.1	3.5		N
9 Dec 1965	SE MO		37.4	91.1	3.5		N
19 Dec 1965	NE AR		35.9	89.9	3.6		N
11 Feb 1966	Blytheville, (NE) AR		35.9	90.0	3.6	IV	Cc/N
13 Feb 1966	Covington, (WC) TN		35.5	89.7	3.6	IV	D/N
13 Feb 1966	SE MO		37.1	91.0	3.6	IV	N
13 Feb 1966	SE MO		37.2	90.9	3.1		N
26 Feb 1966	SE MO		37.2	91.0	3.7		N
13 Mar 1966	NW TN/SE MO		36.2	90.0	3.0		N
22 Jun 1966	SE IL		38.6	88.2	3.1		N
24 Aug 1966	Knoxville, (EC) TN		35.8	84.0	3.8	IV	N/V
9 Sep 1966	EC NE		41.4	96.6	3.5		N
6 Dec 1966	C MO		38.9	92.8	3.0		N
2 Feb 1967	Lansing, (SE) MI		42.7	84.6	3.8	IV	Cc/N
12 Feb 1967	NE AR/SE MO		36.0	90.0	3.1		N
11 Apr 1967	NW TN/SE MO		36.1	89.7	3.0		N
6 Jul 1967	NW TN/SE MO		35.8	90.4	3.4		N
21 Jul 1967	Poplar Bluff, (SE) MO	M_S=2.8	37.5	90.4	4.3	VI	D/N
5 Aug 1967	Cedar Hill & St. Louis Co, (EC) MO		38.3	90.6	2.3	II	D/I
25 Aug 1967	SE MO		37.1	91.1	3.1		N
17 Oct 1967	NW TN/SE MO		36.5	89.5	3.0		N

DATE	LOCALITY		N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)	INFO SOURCE
4 Jan 1968	Hartshorne, (SE) OK	M_L=2.3	34.9	95.5	3.8	IV	Cc/N
23 Jan 1968	NW TN/SE MO		36.5	89.5	3.3		N
9 Feb 1968	New Madrid, (SE) MO		36.5	89.9	3.5	III	Cc/N
31 Mar 1968	SW IL		38.0	89.7	3.5		N
29 May 1968	NW TN/SE MO		36.5	89.5	3.5		N
14 Jul 1968	NW TN/SE MO		36.5	89.5	3.0		N
9 Nov 1968	SW IL		36.0	88.5	3.8	IV	N
9 Nov 1968	Broughton, (SE) IL		38.0	88.5	3.0	IV	D/N
9 Nov 1968	Broughton, (SE) IL	M_S=5.2	38.0	88.5	5.5	VII	D/N
11 Dec 1968	Louisville, (NC) KY		38.3	85.8	3.0	V	Cn/N
1 Jan 1969	Little Rock, (C) AR	M_S=3.3	34.8	92.6	4.5	VI	Cn/N
20 Jan 1969	Fredericktown, (SE) MO		37.8	90.4	3.4	III	Cn/N
28 Feb 1969	SC IL		37.9	88.9	3.2		N
2 May 1969	Lamar, (EC) OK (2)	m_b=3.6	35.2	96.3	4.0	V	Cn/N/O
30 May 1969	SC OK		34.8	97.8	3.0		N
30 Jun 1969	SE KS		37.4	97.0	3.0		N
13 Jul 1969	Knoxville, (EC) TN		36.1	83.7	3.5	V	V
14 Jul 1969	Knoxville, (EC) TN		36.0	83.9	3.0	II	N/V
24 Jul 1969	Knoxville, (EC) TN		36.0	83.9	3.4	III	N/V
27 Jul 1969	NW TN/SE MO		36.5	89.5	3.1		N
7 Jan 1970	Millington & Raleigh, (SW) TN		35.2	89.9	3.8	IV	Cn/N
5 Feb 1970	EC MO		37.9	90.6	3.0	II	N
5 Feb 1970	EC MO		37.9	90.6	3.2	II	N
5 Feb 1970	EC MO		37.9	90.6	3.4	II	N
26 Mar 1970	New Madrid, (SE) MO		36.5	89.7	3.3	III	Cn/N
6 Jul 1970	Leadwood, (SE) MO	M_L=2.6	37.85	90.58	3.0	II	Cn/N
5 Nov 1970	NE AR/SE MO		36.0	90.0	3.0		N
16 Nov 1970	Manila, (NE) AR	M_S=2.9	35.9	90.1	4.4	VI	Cn/N
29 Nov 1970	NW TN/SE MO		36.3	89.5	3.0	III-IV	N
8 Dec 1970	WC TN		38.0	89.0	3.0		N
14 Dec 1970	WC TN/NE AR		35.7	90.0	3.0		N
24 Dec 1970	New Madrid, (SE) MO		36.7	89.5	3.6	IV	CI/N
12 Feb 1971	Albion, (SE) IL		38.52	87.90	3.3	IV	CI/N
1 Mar 1971	LeFlore Co, (SE) OK		35.1	94.9	2.5		O
13 Apr 1971	NE AR		35.8	90.1	3.0		N
12 Jul 1971	Knoxville, (EC) TN		36	84		IV	Cn/V
1 Oct 1971	Lake City, (NE) AR	M_S=2.9	35.84	90.44	4.1	V-VI	Cn/N
9 Oct 1971	Gatlinburg, (EC) TN		35.9	83.5	3.4	V	Cn/V
15 Oct 1971	SE MO		36.7	89.6	3.0		N
31 Jan 1972	Delaplaine,(NE)AR	M_S=2.8;m_b=3.9	36.36	90.84	4.2	VI	Cn/N
29 Mar 1972	New Madrid, (SE) MO		36.2	89.6	3.7	V	Cn/N
6 May 1972	Blytheville & Lepanto, (NE) AR		35.86	89.97	3.4	IV	Cn/N
9 Jun 1972	Desloge, (SE) MO		37.70	90.41	3.1	III-IV	Cn/N
15 Jun 1972	Cape Girardeau, (SE) MO		37.00	89.08	3.2	III	Cn/N
14 Sep 1972	NC IL	M_S=3.3	41.59	89.42	4.4	VI	Cn/N
7 Jan 1973	Madisonville, (WC) KY		37.44	87.30	3.2		N/V
10 Jan 1973	Enid, (NC) OK		36.4	98.0	2.7	I	Cn/O
12 Jan 1973	St. Francois Co, (SE) MO		37.93	90.52	3.2	IV	N/I
18 Apr 1973	St. Clair Co, (SW) IL		38.47	90.20	2.5	II	Cn/I
2 Oct 1973	Mississippi Co, (NE) AR		35.91	90.00	3.4	IV	Cn/I
9 Oct 1973	New Madrid, (SE) MO		36.51	89.61	3.7	IV	Cn/N
30 Oct 1973	Alcoa, (EC) TN	(fore)	35.75	83.9	3.4	V	Cn/N
18 Nov 1973	Leflore Co, (SE) OK		35.0	94.7	3.1		O
30 Nov 1973	Alcoa, (EC) TN	(main & 30+ after)	35.80	83.96	4.6	VI	Cn/N/V
20 Dec 1973	New Madrid, (SE) MO		36.16	89.58	3.4	IV	Cn/N/V
25 Dec 1973	LeFlore Co, (SE) OK		35.1	94.5	2.9		O
7 Jan 1974	NW TN	m_b=4.1	36.20	89.39	4.3	V	CI/N
24 Feb 1974	NE AR		35.82	90.38	3.2		CI/N/SL
4 Mar 1974	NE AR		35.68	90.35	3.0		CI/SL
10 Mar 1974	New Madrid, (SE) MO		36.21	89.53	2.5		CI/SL
12 Mar 1974	WC TN		35.66	89.79	3.2		CI/SL
27 Mar 1974	SW IL		38.55	90.13	2.4	III	CI/SL
3 Apr 1974	SE IL		38.59	88.09	4.7	VI	CI/N
5 Apr 1974	Augusta, (EC) MO		38.59	90.91	2.6	II	CI/SL
13 May 1974	New Madrid, (SE) MO		36.71	89.39	4.1	VI	CI/N
4 Jun 1974	N KY		38.60	84.77	3.6	VI	CI/N/SL
5 Jun 1974	SW IL		38.62	89.94	3.6	V	N
11 Aug 1974	SE MO		36.92	91.17	3.6	V	N/SL
22 Aug 1974	SW IL		38.23	89.73	2.5	IV	CI/SL
1 Oct 1974	Hayti, (SE) MO		36.06	89.93	2.7		SL
7 Nov 1974	Blytheville, (NE) AR		35.95	89.98	2.5		SL
10 Nov 1974	Pontonoc Co, (SE) OK	M_L=2.7	34.8	96.7	2.7		SL
25 Nov 1974	Attica, (WC) IN		40.3	87.4	2.4	II	CI/SL
12 Dec 1974	Tucker & Coy, (C) AR		34.67	91.88	3.4	V	CI/SL
13 Dec 1974	SE MO/NE AR	M_L=2.2	36.70	91.63	2.8		CI/SL
15 Dec 1974	Moore, (C) OK	M_L=2.6	35.33	97.48	2.6	III	O/CI
25 Dec 1974	Blytheville, (NE) AR	M_L=3.0	35.78	90.01	2.4	II	CI/SL
2 Jan 1975	Forest City, (EC) AR		34.87	90.94	3.0	II-III	P/N
13 Feb 1975	Marston, (SE) MO		36.52	89.56	3.3	V	CI/P
31 Mar 1975	Muskogee Co, (EC) OK	M_L=2.9	35.6	95.3	2.9		O
2 May 1975	Oakdale, (EC) TN		35.92	84.45	2.6	III	CI/P
13 May 1975	Chambers, (NE) NE		42.12	98.45	3.5	VI	P/N
14 May 1975	Oakridge, (C) TN		35.95	85.25	2.7	II	CI/P
13 Jun 1975	Lilbourn, (SE) MO		36.54	89.68	4.3	V	P/CI/N
20 Jun 1975	Miston, (NW) TN		36.21	89.44	3.3		SL
6 Jul 1975	Miston, (NW) TN/SE MO		36.19	89.49	2.9	II	P/SL
11 Aug 1975	Dayton, (WC) OH		39-3/4	84-1/4		II	CI
20 Aug 1975	Malden, (SE) MO		36.56	89.80	2.9		P/SL
24 Aug 1975	SE MO		37.23	90.89	2.7		P/SL
24 Aug 1975	SE MO		37.23	90.88	2.8		P/SL
25 Aug 1975	New Madrid, (SE) MO		36.05	89.84	3.0		N/P/SL
25 Sep 1975	Marked Tree, (NE) AR		35.74	90.30	2.5		SL
12 Oct 1975	SC OK		34.82	97.41	3.2		P
30 Oct 1975	Pottawatomie Co, (EC) OK	M_L=2.7	35.3	96.8	2.7		O
29 Nov 1975	Foster, (SC) OK		34.52	97.35	3.5	VI	CI/O
2 Dec 1975	New Madrid, (SE) MO		36.54	89.57	2.8	VI	CI/SL

DATE	LOCALITY		N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)	INFO SOURCE
16 Jan 1976	Onia, (NC) AR	M_L=3.2	35.92	92.12	3.2	V	CI/P
19 Jan 1976	Barbourville, (SE) KY	M_L=3.8	36.88	83.82	4.0	VI	CI/P
22 Jan 1976	Marston, (SE) MO	M_L=2.0	36.55	89.60	2.0	IV	CI/SL
4 Feb 1976	Conesauga, (SE) TN/N GA		35.00	84.75	3.0	VI	P/CI
16 Mar 1976	Eufaula, (EC) OK	M_L=2.3	35.30	95.50	2.3	III	CI/O
24 Mar 1976	Jonesboro, (NE) AR	M_L=5.0	35.59	90.48	5.0	VI	CI/SL
24 Mar 1976	Marked Tree, (NE) AR	M_L=4.5	35.61	90.48	4.5	II	CI/SL
8 Apr 1976	Stinesville, (WC) IN		39.35	86.68	3.0	V	CI
15 Apr 1976	Crofton, (SW) KY		37.40	87.30	3.3	V	CI/E
22 May 1976	Steele, (SE) MO		36.04	89.84	3.2	V	P/SL
13 Jun 1976	Indianapolis, (C) IN	(2)	40	86		II	CI
25 Sep 1976	Truman, (NE) AR		35.61	90.45	3.6	V	CI/SL
20 Oct 1976	Coal Co, (SE) OK		34.75	96.12	2.5		O
22 Oct 1976	Pottawatomie Co, (EC) OK		35.38	97.06	3.0		O
13 Dec 1976	Flat River, (SE) MO		37.80	90.24	3.5	V	CI/SL
19 Dec 1976	McAlester, (SE) OK		34.92	95.73	2.9	II	CI/O
3 Jan 1977	Appleton, (SE) MO	(1 fore;main)	37.55	89.79	3.4	VI	CI/SL
3 Jan 1977	Appleton, (SE) MO	(7 after)	37.56	89.75	2.6	Felt	SL
28 Feb 1977	Effingham Co, (EC) IL		39.17	88.40	2.9		SL
28 Mar 1977	Marston, (SE) MO		36.48	89.54	2.9	II	CI/SL
15 Apr 1977	Whitewater, (SE) MO		37.22	89.81	2.5	Felt	SL
2 Jun 1977	Board Camp & Hatfield, (WC) AR		34.61	94.19	4.0	VI	CI/P
17 Jun 1977	Celina, (WC) OH		40.71	84.58	3.2	VI	P
27 Jul 1977	Ducktown, (EC) TN		35.42	84.42	3.5	V	CI/P
4 Oct 1977	Dyersburg, (NW) TN		36.24	89.35	3.0		SL
9 Nov 1977	New Madrid, (SE) MO		36.61	89.59	2.8		SL
20 Nov 1977	Malvern, (C) AR		34.52	92.96	3.1	IV	CI/P
18 Jan 1978	Ridgely, (NW) TN		36.25	89.42	2.6		SL
16 Feb 1978	Tuscola, (EC) IL		39.80	88.23	2.7		SL
30 Mar 1978	Lake Co, (NW) TN		36.27	89.47	2.6		SL
3 Apr 1978	New Madrid Co, (SE) MO	(2)	36.62	90.0	3.0		SL
5 Apr 1978	Blytheville, (NE) AR		35.97	89.91	2.8		SL
2 Jun 1978	Fairfield, (SE) IL		38.42	88.46	3.7	V	E/SL
20 Jul 1978	NE/AR		35.89	90.13	2.6		SL
30 Aug 1978	Dyersburg, (NW) TN		36.09	89.42	3.5	V	E/SL
7 Sep 1978	SE/MO		36.55	89.60	2.5		SL
10 Sep 1978	SE/MO		36.10	89.76	2.6		SL
20 Sep 1978	St. Louis, (EC) MO		38.57	90.26	3.2	VI	E/SL
25 Sep 1978	NE AR		36.31	91.14	3.1		SL
4 Dec 1978	West Salem, (SW) IL		38.62	88.36	3.5	Felt	SL
6 Dec 1978	SW KY		36.61	89.06	2.5		SL
2 Feb 1979	Ridgely, (NW) TN	(swarm)	36.27	89.47	2.0	II-III	SL
4 Feb 1979	Blytheville, (NE) AR		35.84	90.08	3.2	IV	E/SL
17 Feb 1979	SW KY		36.99	88.95	2.0		SL
27 Feb 1979	Powhattan, (NE) AR	(swarm)	35.92	91.24	3.1	V	E/SL
10 Jun 1979	Caruthersville, (SE) MO		36.17	89.65	3.8	V	E/SL
25 Jun 1979	Marked Tree, (SE) MO		35.53	90.43	3.0	V	E/SL
30 Jun 1979	Washington Co, (NE) KS		39.9	97.3	3.3	V	E
8 Jul 1979	Charlestown, (SE) MO		36.89	89.29	3.1	Felt	SL
13 Jul 1979	Caruthersville, (SE) MO		36.08	89.77	2.8	Felt	SL
12 Aug 1979	SE TN		35.21	84.35	3.5	Felt	V
12 Sep 1979	Maryville & Alcoa, (SE) TN		35.57	83.93	3.2	V	E/V
12 Sep 1979	Paragould, (SE) MO		37.74	89.95	2.5	Felt	SL
12 Sep 1979	Carter, (SW) OK		35.2	99.5	3.4	IV	E
11 Oct 1979	SC MO		36.72	91.30	2.8		SL
5 Nov 1979	Dalton, (NE) AR		36.44	91.01	3.2	V	E/SL
26 Nov 1979	NW TN		36.36	89.52	2.7		SL
12 Mar 1980	McCleansboro, (SE) IL		37.93	88.45	3.3	Felt	SL
23 Mar 1980	Fordsville, (NC) KY		37.63	86.69	3.3	IV	E/SL
25 Jun 1980	Maryville, (SE) TN		35.78	86.05	3.3	IV	E/P

Complete through 30 June 1980

DATE	LOCALITY		N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)	INFO SOURCE
5 Jul 1980	New Madrid, (SE) MO		36.60	89.56	4.8	VII	SL
27 Jul 1980	Maysville, (NC) KY	M_L=5.1	38.20	83.94	4.8	VII	EERI
11 Sep 1980	SE MO		36.89	90.41	2.6		SL
19 Sep 1980	SE MO		37.07	90.63	2.5		SL

EARTHQUAKES WITH BOTH MAGNITUDE AND INTENSITY DETERMINED

DATE	N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)
28 Jan 1956	35.6	89.6	4.7	VI
16 Feb 1956	35.4	97.3	4.7	VI
30 Oct 1956	36.2	95.9	4.7	VII
15 Jun 1959	34.7	96.7	4.2	V
17 Jun 1959	34.6	96.4	4.7	VI
20 Jul 1959	35.9	89.8	3.4	III
12 Aug 1959	35.0	87.0	4.7	VI
21 Dec 1959	36.0	89.5	4.2	V
28 Jan 1960	36.0	89.5	4.2	V
21 Apr 1960	36.0	89.5	4.2	V
10 Jan 1961	34.9	95.5	4.2	V
26 Apr 1961	34.6	95.0	3.8	III
26 Apr 1961	34.6	95.0	3.0	III
27 Apr 1961	34.9	95.3	4.2	V
9 Sep 1961	36.4	91.3	3.5	IV
25 Dec 1961	39.1	94.6	3.6	IV
25 Dec 1961	39.1	94.6	3.8	V
2 Feb 1962	35.6	89.6	4.3	VI
16 Feb 1962	37.0	88.7	3.6	III-IV
26 Jun 1962	37.7	88.5	4.4	V
13 Jul 1962	36.9	90.0	3.2	II-III
23 Jul 1962	36.1	89.8	4.2	VI
3 Mar 1963	36.7	90.0	4.7	VI
2 Aug 1963	37.0	88.8	4.4	V
5 Dec 1963	37.2	87.0	3.2	II-III
14 Dec 1963	37.2	87.1	3.4	III
18 Feb 1964	34.8	85.5	4.2	V
16 Mar 1964	36.2	89.6	3.5	IV
23 May 1964	36.5	89.9	3.9	IV-V
23 May 1964	36.5	90.0	3.6	III
28 Jul 1964	36.0	83.9	3.0	II
13 Oct 1964	36.0	83.9	3.2	II-III
10 Feb 1965	36.4	89.7	3.3	III
6 Mar 1965	37.4	91.1	4.1	III
25 Mar 1965	36.4	89.5	3.7	III
13 Aug 1965	37.3	89.5	3.2	IV
14 Aug 1965	37.1	89.2	3.8	VII
14 Aug 1965	37.4	89.5	3.4	V
15 Aug 1965	37.4	89.5	3.4	V
20 Oct 1965	37.5	91.0	4.9	VI
11 Feb 1966	35.9	90.0	3.5	IV
13 Feb 1966	35.5	89.7	3.6	IV
13 Feb 1966	37.1	91.0	3.5	IV
24 Aug 1966	35.8	84.0	3.9	IV

DATE	N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)
2 Feb 1967	42.7	84.6	3.8	IV
21 Jul 1967	37.5	90.4	4.3	VI
5 Aug 1967	38.3	90.6	2.3	II
4 Jan 1968	34.9	95.5	3.8	IV
9 Feb 1968	36.5	89.9	3.5	III
9 Nov 1968	38.0	88.5	3.8	IV
9 Nov 1968	38.0	88.5	3.0	IV
9 Nov 1968	38.0	88.5	5.5	VII
11 Dec 1968	38.3	85.8	3.0	V
1 Jan 1969	34.8	92.6	4.5	VI
20 Jan 1969	37.8	90.4	3.4	III
2 May 1969	35.2	96.3	4.0	V
13 Jul 1969	36.1	83.7	3.5	V
14 Jul 1969	36.0	83.9	3.0	II
24 Jul 1969	36.0	83.9	3.4	III
7 Jan 1970	35.2	89.9	3.8	IV
5 Feb 1970	37.9	90.6	3.0	II
5 Feb 1970	37.9	90.6	3.2	II
5 Feb 1970	37.9	90.6	3.4	II
26 Mar 1970	36.5	89.7	3.3	III
6 Jul 1970	37.85	90.58	3.0	II
16 Nov 1970	35.9	90.1	4.4	VI
29 Nov 1970	36.3	89.5	3.0	III-IV
24 Dec 1970	36.7	89.5	3.6	IV
12 Feb 1971	38.52	87.90	3.3	IV
1 Oct 1971	35.84	90.44	4.1	V-VI
9 Oct 1971	35.9	83.5	3.4	V
31 Jan 1972	36.36	90.84	4.2	VI
29 Mar 1972	36.2	89.6	3.7	V
6 May 1972	35.88	89.97	3.4	IV
9 Jun 1972	37.70	90.41	3.1	III-IV
18 Jun 1972	37.00	89.08	3.2	III
14 Sep 1972	41.59	89.42	4.4	VI
10 Jan 1973	36.4	98.0	2.7	I
12 Jan 1973	37.93	90.52	3.2	IV
18 Apr 1973	38.47	90.20	2.5	II
2 Oct 1973	35.91	90.00	3.4	IV
9 Oct 1973	36.51	89.61	3.7	IV
30 Oct 1973	35.75	83.90	3.4	V
30 Nov 1973	35.80	83.96	4.6	VI
20 Dec 1973	36.16	89.58	3.4	IV
7 Jan 1974	36.20	89.39	4.3	V
27 Mar 1974	38.55	90.13	2.4	III
3 Apr 1974	38.59	88.09	4.7	VI
5 Apr 1974	38.59	90.91	2.6	II
13 May 1974	36.71	89.39	4.1	VI
4 Jun 1974	38.60	84.77	3.6	VI
5 Jun 1974	38.62	89.94	3.6	V

DATE	N LAT	W LONG	MAG (m_b)	INTENSITY (max. MM)
11 Aug 1974	36.92	91.17	3.6	V
22 Aug 1974	38.23	89.73	2.5	IV
25 Nov 1974	40.3	87.4	2.4	II
12 Dec 1974	34.67	91.88	3.4	V
15 Dec 1974	35.33	97.48	2.6	III
25 Dec 1974	35.78	90.01	2.4	II
2 Jan 1975	34.87	90.94	3.0	II-III
13 Feb 1975	36.52	89.56	3.3	V
2 May 1975	35.92	84.45	2.6	III
13 May 1975	42.12	98.45	3.5	VI
14 May 1975	35.95	85.25	2.7	II
13 Jun 1975	36.54	89.68	4.3	V
6 Jul 1975	36.19	89.49	2.9	II
29 Nov 1975	34.52	97.35	3.5	VI
2 Dec 1975	36.54	89.57	2.8	VI
16 Jan 1976	35.92	92.12	3.2	V
19 Jan 1976	36.88	83.82	4.0	VI
22 Jan 1976	36.55	89.60	2.0	IV
4 Feb 1976	35.00	84.75	3.0	VI
16 Mar 1976	35.30	95.50	2.3	III
24 Mar 1976	35.59	90.48	5.0	VI
24 Mar 1976	35.61	90.48	4.5	II
8 Apr 1976	39.35	86.68	3.0	V
15 Apr 1976	37.40	87.30	3.3	V
22 May 1976	36.04	89.84	3.2	V
25 Sep 1976	35.61	90.45	3.6	V
13 Dec 1976	37.80	90.24	3.5	V
19 Dec 1976	34.92	95.73	2.9	II
3 Jan 1977	37.55	89.79	3.4	VI
28 Mar 1977	36.48	89.54	2.9	II
2 Jun 1977	34.61	94.19	4.0	VI
17 Jun 1977	40.71	84.58	3.2	VI
27 Jul 1977	35.42	84.42	3.5	V
26 Nov 1977	34.52	92.96	3.1	IV
2 Jun 1978	38.42	88.46	3.7	V
30 Aug 1978	36.09	89.42	3.5	V
20 Sep 1978	38.57	90.28	3.2	VI
2 Feb 1979	36.27	89.47	2.0	II-III
4 Feb 1979	35.84	90.08	3.2	IV
27 Feb 1979	35.92	91.24	3.1	V
10 Jun 1979	36.17	89.65	3.8	V
25 Jun 1979	35.53	90.43	3.0	V
30 Jun 1979	39.9	97.3	3.3	V
12 Sep 1979	35.57	83.93	3.2	V
12 Sep 1979	35.2	99.5	3.4	IV
5 Nov 1979	35.44	91.01	3.2	V
27 Jul 1980	38.20	83.94	4.8	VII

YEAR.MODA	LOCALITY	N LAT	W LON	M	Io
	*** ZONE ANNA ***				
1956.0127	ANNA/SIDNEY/LIMA/BOTKINS, (WC) OH	40.40	84.20	-4.2	V
1944.1113	BOTKINS & ANNA, (WC) OH	40.40	84.40	-4.3	III
1939.0709	ANNA, (WC) OH	40.30	84.00	-3.0	II
1939.0617	ANNA, (WC) OH	40.30	84.00	-3.8	IV
1939.0318	JACKSON CENTER, (WC) OH	40.40	84.00	-3.0	II
1939.0318	WC OH	40.40	84.00	-3.6	III-IV
1937.0502	ANNA, (WC) OH	40.70	84.00	-3.8	IV
1937.0427	ANNA, (WC) OH	40.70	84.00	-3.4	III
1937.0423	ANNA, (WC) OH	40.70	84.00	-3.4	III
1937.0309	ANNA & SIDNEY, (WC) OH (MAIN)	40.40	84.20	-5.3	VII-VIII
1937.0303	ANNA, (WC) OH	40.70	84.00	-4.2	V
1937.0303	ANNA, (WC) OH	40.70	84.00	-3.4	III
1937.0302	ANNA & SIDNEY, (WC) OH (SWARM)	40.40	84.20	-5.3	VII
1933.0222	SIDNEY, (WC) OH	40.30	84.20	-3.8	IV
1931.1008	ANNA, (WC) OH	40.40	84.20	-3.4	III
1931.0920	ANNA, (WC) OH	40.40	84.20	-5.3	VII
1931.0321	JACKSON CENTER, (WC) OH	40.40	84.00	-3.4	III
1931.0321	SIDNEY & JACKSON CENTER, (WC) OH	40.40	84.20	-3.4	III
1930.1000	ANNA, (WC) OH	40.40	84.20	-3.6	III-IV
1930.0930	ANNA, (WC) OH	40.30	84.30	-5.3	VII
1930.0929	ANNA & SIDNEY, (WC) OH	40.40	84.20	-3.4	III
1930.0927	SIDNEY & LIMA, (WC) OH	40.50	84.00	-3.8	IV
1930.0626	LIMA & BELLEFONTAINE, (WC) OH	40.50	84.00	-3.8	IV
1929.0309	BELLEFONTAINE, (WC) OH	40.40	84.20	-4.2	V
1928.1027	JACKSON CENTER, (WC) OH	40.40	84.10	-3.4	III
1925.1000	ANNA, (WC) OH	40.40	84.20	-3.4	III
1914.0000	ANNA, (WC) OH	40.40	84.20	-3.4	III
1906.0423	WC OH	40.70	83.60	-4.2	V
1892.0000	ANNA, (WC) OH	40.40	84.20	-3.0	
1899.0900	ANNA, (WC) OH	40.40	84.20	-3.4	III
1884.1222	ANNA, (WC) OH	40.40	84.20	-3.4	III
1884.0919	LIMA, (WC) OH	40.70	84.10	-4.7	VI
1882.0209	BOTKINS & SWANDERS, (WC) OH	40.40	84.20	-4.2	V
1876.0600	EC OH	40.40	84.20	-4.2	
1875.0618	CHAMPAIGN CO, (WC) OH	40.20	84.00	-5.3	VII
	*** ZONE SIWB ***				
1978.1204	WEST SALEM, (SW) IL	38.62	88.36	3.5	
1978.0602	FAIRFIELD, (SE) IL	38.42	88.46	3.7	V
1974.0403	SE IL	38.59	88.09	4.7	VI
1971.0212	ALBION, (SE) IL	38.52	87.90	3.3	IV
1970.1208	WC TN	38.00	89.00	3.0	
1969.0229	SW IL	37.90	88.90	3.2	
1968.1109	SW IL	38.00	88.50	3.8	IV
1968.1109	BROUGHTON, (SE) IL	38.00	88.50	3.0	IV
1968.1109	BROUGHTON, (SE) IL MS=5.2	38.00	88.50	5.5	VII
1965.0622	SE IL	38.60	88.20	3.1	
1962.0626	JOHNSON CITY, (S) IL	37.70	88.50	4.4	V
1958.1107	SE IL/SW IN	38.40	87.90	-4.7	VI
1955.0529	EWING, (SC) IL	38.10	88.90	-3.4	III
1954.0909	PETERSBURG, (SW) IN	38.50	87.30	-3.8	IV
1953.1230	CENTRALIA, (SW) IL	38.60	89.10	-3.8	IV
1948.0105	CENTRALIA, (SW) IL	38.60	89.10	-4.0	IV-V
1946.0224	CENTRALIA, (SW) IL	38.60	89.10	-3.8	IV
1940.1229	EVANSVILLE, (SW) IN WC KY	37.90	87.30	-3.6	III
1937.1117	CENTRALIA, (SW) IL	38.60	89.10	-4.4	V
1931.1231	PETERSBURG, (SW) IN	38.50	87.20	-3.0	II
1929.0214	PRINCETON, (SW) IN	38.30	87.60	-3.8	IV
1926.1026	SW IN	38.30	87.60	-4.0	IV
1926.1007	PRINCETON, (SW) IN	38.30	87.60	-3.4	III
1926.0322	HARRISBURG, (SW) IL	37.80	88.60	-4.0	IV
1925.0920	HENDERSON, (WC) KY/SW IN	37.80	87.50	-4.1	IV
1925.0902	HENDERSON, (WC) KY (2)	37.80	87.50	-4.5	VI

YEAR.MODA	LOCALITY	N LAT	W LON	M	Io
	*** ZONE SIWB ***				
1925.0426	PRINCETON, (SW) IN/WC KY	38.30	87.60	-5.0	VI-VII
1922.1126	EL DORADO, (SW) IL	37.80	88.50	-5.0	VI-VII
1922.0110	MT. VERNON, (SW) IN/WC KY	37.90	87.80	-4.2	IV-V
1921.0331	MT. VERNON, (SW) IN/WC KY	37.90	87.80	-3.8	IV
1920.0430	CENTRALIA, (SW) IL	38.60	89.10	-4.0	IV
1919.0525	PRINCETON, (SW) IN (2)	38.40	87.50	-4.4	V
1919.0210	HENDERSON, (WC) KY/SW IN	37.80	87.50	-3.8	III-IV
1915.0415	OLNEY, (SE) IL	38.70	88.10	-3.8	II-III
1906.0907	OWENSVILLE, (SW) IN	38.20	87.70	-3.8	IV
1906.0521	FLORA, (SE) IL	38.70	88.40	-4.3	V
1906.0511	PETERSBURG, (SW) IN	38.50	87.20	-3.8	IV
1903.0921	OLNEY, (SE) IL	38.70	88.10	-3.8	IV
1899.0429	JEFFERSONVILLE/SHELBYVILLE,(SW) IN	38.80	87.00	-5.0	VII
1891.0926	S IL/SW IN LAT?/LON	38.00	88.00	-5.8	VII
1891.0726	EVANSVILLE, (SW) IN/WC KY	37.90	87.50	-4.5	VI
1887.0206	VINCENNES, (SW) IN/SE IL	38.70	87.50	-4.7	VI
1877.0526	NEW HARMONY, (SW) IN/SE IL	39.20	27.90	-3.6	III-IV
1876.0926	FRIENDSVILLE, (SE) IL/SW IN	38.50	87.80	-3.4	III
1876.0925	EVANSVILLE, (SW) IN/SE IL	38.50	87.80	-4.7	VI
1876.0924	FRIENDSVILLE, (SE) IL/SW IN	38.50	87.80	-4.7	VI
1860.0807	HENDERSON, (WC) KY/SW IN	37.30	87.50	-4.4	V
1857.1008	ST. LOUIS, (EC) MO/S IL	38.70	89.20	-5.3	VII
1838.0609	ST. LOUIS, (EC) MO/S IL	38.50	89.00	-5.7	VII-VIII
	*** ZONE EEMB ***				
1979.0217	SE KY	36.99	88.95	2.6	
1972.0618	CAPE GIRARDEAU, (SE) MO	37.00	89.08	3.2	III
1963.0802	PADUCAH, (NW) KY/S IL	37.00	88.80	4.4	V
1962.0216	SW KY	37.00	88.70	-3.6	III-IV
1962.0202	NEW MADRID, (SE) MO MS=3.5	35.60	89.60	4.3	VI
1957.0326	PADUCAH, (SW) KY	37.00	88.40	-3.8	IV
1947.0326	SW KY	37.00	88.40	-4.0	IV
1940.0521	PADUCAH, (SW) KY	37.10	88.60	-4.2	V
1936.0902	CAIRO, (SC) IL/NW TN/SW KY	36.70	89.00	-3.8	III
1931.0406	BERKLEY & BARDWELL, (SW) KY	36.80	89.00	-3.8	IV
1931.0401	HOPKINSVILLE, (SW) KY/SC IL	36.90	88.30	-3.8	III
1930.0903	BLANDVILLE, (SW) KY	37.00	88.90	-3.4	III
1930.0903	BLANDVILLE, (SW) KY	37.00	88.90	-3.4	III
1930.0102	RIPLEY, (WC) TN	35.70	89.50	-3.0	II
1927.0507	OBRION CO, (NW) TN	36.50	89.00	-5.7	VII
1925.0513	MAYFIELD, (SW) KY	36.70	88.60	-3.8	IV-V
1924.0402	PADUCAH, (SW) KY/S IL	37.10	88.60	-3.8	IV
1922.0323	BLANDVILLE, (SW) KY	37.00	88.90	-4.3	IV
1922.0322	S IL/SW KY	37.30	88.90	-4.2	V
1922.0322	S IL	37.30	88.90	-4.6	V
1916.1019	MAYFIELD, (SW) KY	36.70	88.60	-3.4	III
1915.1026	MAYFIELD (SW) KY	36.70	88.60	-4.2	V
1909.1231	BLANDVILLE, (SW) KY	37.00	88.90	-3.4	III
1908.1227	SE MO	37.00	89.00	-4.4	IV
1897.0430	SW KY	37.00	89.00	-4.0	IV-V
1897.0425	OSCEOLA, (NE) AR/WC TN/S IL	35.80	89.60	-4.1	V
1872.0326	PADUCAH, (SW) KY S IL	37.10	88.60	-3.4	III
1839.0905	MAYFIELD, (SW) KY	36.70	88.60	-3.8	IV
	*** ZONE NMAD ***				
1979.1125	NW TN	36.36	89.52	2.7	
1979.0713	CARUTHERSVILLE, (SE) MO	36.08	89.77	2.8	
1979.0708	CHARLESTOWN, (SE) MO	36.89	89.29	3.1	
1979.0625	MARKED TREE, (SE) MO	35.53	90.43	3.0	V
1979.0610	CARUTHERSVILLE, (SE) MO	36.17	89.65	3.8	V
1979.0204	BLYTHEVILLE, (NE) AR	35.34	90.06	3.2	IV
1979.0202	RIDGELY, (NW) TN (SWA	36.27	89.47	2.0	II-III
1973.1206	SW KY	36.61	89.06	2.5	
1979.0910	SE MO	36.10	89.76	2.6	

YEAR.MODA	LOCALITY		N LAT	W LON	MB	Io
	*** ZONE NMAD ***					
1978.0907	SE MO		36.55	89.66	2.5	
1978.0830	DYERSBURG, (NW) TN		36.09	89.42	3.5	V
1978.0720	NE AR		35.89	90.13	2.6	
1978.0405	BLYTHEVILLE, (NE) AR		35.97	89.91	2.8	
1978.0330	LAKE CO, (NW) TN		36.27	89.47	2.6	
1978.0118	RIDGELY, (NW) TN		36.25	89.42	2.6	
1977.1109	NEW MADRID, (SE) MO		36.61	89.59	2.8	
1977.1004	DYERSBURG, (NW) TN		36.24	89.35	3.0	
1977.0328	MARSTON, (SE) MO		36.48	89.54	2.9	
1976.0925	TRUMAN, (NE) AR		35.61	90.45	3.6	V
1976.0522	STEELE, (SE) MO		36.04	89.84	3.2	V
1976.0324	JONESBORO, (NE) AR	ML=5.0	35.59	90.48	5.0	VI
1976.0324	MARKED TREE, (NE) AR	ML=4.5	35.61	90.48	4.5	II
1976.0122	MARSTON, (SE) MO	ML=2.0	36.55	89.60	2.0	IV
1975.1202	NEW MADRID, (SE) MO		36.54	89.57	2.8	VI
1975.0925	MARKED TREE, (NE) AR		35.74	90.30	2.5	
1975.0925	NEW MADRID, (SE) MO		36.05	89.84	3.0	
1975.0820	MALDEN, (SE) MO		36.56	89.60	2.9	
1975.0706	MISTON, (NW) TN SE MO		36.19	89.49	2.9	II
1975.0620	MISTON, (NW) TN		36.21	89.44	3.3	
1975.0612	LILBOURN, (SE) MO		36.54	89.68	4.3	V
1975.0213	MARSTON, (SE) MO		36.52	89.56	3.3	V
1975.0102	FOREST CITY, (EC) AR		34.87	90.94	3.0	II-III
1974.1225	BLYTHEVILLE, (NE) AR	ML=3.0	35.78	90.01	2.4	II
1974.1107	BLYTHEVILLE, (NE) AR		35.95	89.98	2.5	
1974.1001	HAYTI, (SE) MO		36.06	89.93	2.7	
1974.0513	NEW MADRID, (SE) MO		36.71	89.39	4.1	VI
1974.0312	WC TN		35.66	89.79	3.2	
1974.0310	NEW MADRID, (SE) MO		36.21	89.53	2.5	
1974.0304	NE AR		35.68	90.35	3.0	
1974.0224	NE AR		35.82	90.38	3.2	
1974.0107	NW TN	MB=4.3	36.20	89.40	4.3	V
1973.1220	NEW MADRID, (SE) MO		36.16	89.58	3.4	IV
1973.1009	NEW MADRID, (SE) MO		36.51	89.61	3.7	IV
1973.1002	MISSISSIPPI CO, (NE) AR		35.91	90.00	3.4	IV
1972.0506	BLYTHEVILLE & LEPANTO, (NE) AR		35.88	89.97	3.4	IV
1972.0329	NEW MADRID, (SE) MO		36.20	89.[illegible]	3.7	V
1971.1018	SE MO		36.70	89.60	3.0	
1971.1001	LAKE CITY, (NE) AR	MS=2.9	35.64	90.44	4.1	V-VI
1971.0417	NE AR		35.80	90.10	3.0	
1970.1224	NEW MADRID, (SE) MO		36.70	89.50	3.6	IV
1970.1214	WC TN/NE AR		35.70	90.00	3.0	
1970.1129	NW TN/SE MO		36.30	89.50	3.0	III-IV
1970.1116	MANILA, (NE) AR	MS=2.9	35.90	90.10	4.4	VI
1970.1105	NE AR SE MO		36.00	90.00	3.0	
1970.0326	NEW MADRID, (SE) MO		36.50	89.70	3.3	III
1970.0107	MILLINGTON & RALEIGH, (SW) TN		35.20	89.90	3.8	IV
1969.0727	NW TN SE MO		36.50	89.50	3.1	
1968.0714	NW TN/SE MO		36.50	89.50	3.0	
1968.0529	NW TN SE MO		36.50	89.50	3.5	
1969.0209	NEW MADRID, (SE) MO		36.50	89.90	3.5	III
1969.0123	NW TN/SE MO		36.50	89.50	3.3	
1967.1017	NW TN/SE MO		36.50	89.50	3.0	
1967.0706	NW TN SE MO		35.60	90.40	3.4	
1967.0411	NW TN SE MO		36.10	89.70	3.0	
1967.0212	NE AR SE MO		36.00	90.00	3.1	
1966.0213	NW TN SE MO		36.20	90.00	3.0	
1966.0213	COVINGTON, (SW) TN		35.50	89.70	3.6	IV
1966.0211	BLYTHEVILLE, (NE) AR		35.90	90.00	3.6	IV
1965.1219	NE AR		35.90	89.90	3.5	
1965.0514	TAMMS, (SW) IL		37.10	89.20	3.8	VII
1965.0513	SE MO		37.10	89.30	3.0	
1965.0703	NW TN SE MO		36.50	89.50	3.[illegible]	
1965.0601	NW TN SE MO		36.50	89.50	3.0	
1965.0525	NW TN SE MO		36.10	89.40	3.[illegible]	
1965.0126	SE MO NW TN		36.50	89.50	3.1	

YEAR.MODA	LOCALITY	N LAT	W LON	MB	Io
	*** ZONE NMAD ***				
1965.0325	NEW MADRID, (SE) MO	36.40	89.50	3.7	III
1965.0210	SE MO	36.40	89.70	3.3	III
1964.0523	SE MO	36.50	89.90	3.9	IV-V
1964.0316	CARUTHERSVILLE, (SE) MO	36.20	89.60	3.5	IV
1964.0125	SE MO/NW TN	36.50	89.50	3.0	
1964.0115	SE MO	36.80	89.50	3.2	
1963.0501	SE MO	36.70	89.40	3.1	
1963.0406	SE MO	36.40	89.80	3.1	
1963.0331	SE MO/NW TN	36.50	89.50	3.0	
1962.0723	DYERSBURG, (NW) TN/SE MO	36.10	89.80	4.2	VI
1962.0601	EC AR/SW TN/NW MS	36.00	90.20	-3.2	
1962.0524	SE MO/NW TN	36.50	89.50	3.0	
1962.0225	SE MO/NW TN	36.50	89.50	3.2	
1960.0421	LAKE CO, (NW) TN	36.00	89.50	4.2	V
1960.0128	DYER CO, (NW) TN	36.00	89.50	4.2	V
1959.1221	FINLEY, (NW) TN	36.00	89.50	4.2	V
1959.0720	BLYTHEVILLE, (NE) AR	35.90	89.80	3.4	III
1959.0213	BOGOTA, (NW) TN	36.10	89.50	-4.2	V
1959.0121	RIDGELY, (NW) TN	36.30	89.50	-3.8	IV
1958.0519	MARKED TREE, (NE) AR	35.50	90.40	-3.8	IV
1958.0426	LAKE CO, (NW) TN	36.40	89.50	-4.2	IV
1958.0408	TROY CO & OBION CO, (NW) TN	36.30	89.20	-4.2	V
1958.0127	MOUNDS, (S) IL/SW KY/SE MO	37.10	89.20	-4.2	V
1958.0126	MEMPHIS, (SW) TN/SE MO	36.10	89.70	-4.2	V
1957.0817	BOGOTA, (NW) TN	36.20	89.50	-3.8	IV
1956.1029	CARUTHERSVILLE, (SE) MO	36.10	89.70	-4.2	V
1956.0128	COVINGTON, (WC) TN/NE AR	35.63	89.61	4.7	VI
1956.0123	CARUTHERSVILLE, (SE) MO	36.10	89.70	-3.2	II-III
1955.1213	DYER CO, (NW) TN	36.00	89.50	-4.2	V
1955.1213	DYER CO, (NW) TN	36.00	89.50	-3.4	III
1955.0924	TIPTONVILLE, (NW) TN	36.40	89.50	-3.8	IV
1955.0906	NW TN	36.00	89.50	-3.4	III
1955.0905	FINLEY, (NW) TN	36.00	89.50	-4.2	V
1955.0329	FINLEY, (NW) TN	36.00	89.50	-4.7	VI
1955.0125	FINLEY, (NW) 147NE AR/SE MO	36.00	89.50	-4.7	VI
1954.0426	MEMPHIS, (SW) TN	35.10	90.00	-4.4	V
1954.0117	DYERSBURG, (NW) TN	36.00	89.40	-3.8	IV
1953.0515	CAIRO, (S) IL SW KY/SE MO	37.00	89.20	-3.4	III
1953.0512	LEPANTO, (NE) AR	35.60	90.30	-3.8	IV
1953.0506	CAIRO, (S) IL/SW KY/SE MO	37.00	89.20	-3.4	III
1953.0219	FINLEY, (NW) TN	36.00	89.50	-3.4	III
1953.0217	FINLEY, (NW) TN	36.50	89.50	-3.8	IV
1953.0217	FINLEY, (NW) TN/SE MO	36.50	89.50	-3.4	III
1953.0211	NEW MADRID, (SE) MO	36.50	89.50	-3.8	IV
1952.1228	MISSISSIPPI CO, (SE) MO	36.70	89.60	-3.4	III
1952.1225	BLYTHEVILLE, (NE) AR	35.90	89.80	-3.0	II
1952.1224	BLYTHEVILLE, (NE) AR	35.90	89.80	-4.1	IV
1952.1224	BLYTHEVILLE, (NE) AR	36.10	90.00	-3.7	IV
1952.1016	DYERSBURG, (NW) TN	36.20	89.60	-3.8	IV
1952.1016	DYERSBURG, (NW) TN	36.20	89.60	-3.2	II-III
1952.1016	DYERSBURG, (NW) TN	36.20	89.60	-3.2	II-III
1952.1016	DYERSBURG, (NW) TN	36.20	89.60	-3.2	II-III
1952.0716	DYERSBURG, (NW) TN	36.20	89.60	-4.7	VI
1952.0716	NW TN	36.20	89.60	-3.8	IV
1952.0522	NEW MADRID, (SE) MO	36.60	89.70	-3.3	IV
1952.0220	TIPTONVILLE, (NW) TN SE MO	36.40	89.50	-4.2	V
1951.1213	LEPANTO, (NE) AR	35.60	90.30	-3.2	II-III
1951.1217	NEW MADRID, (SE) MO/NE AR	35.60	90.30	-3.4	III
1950.0501	GIDEON, (SE) MO	36.50	89.90	-3.2	II-III
1949.0913	CARUTHERSVILLE, (SE) MO	36.10	89.70	-3.4	III
1949.0131	SE MO	36.30	89.70	-4.2	V
1949.1113	PORTAGEVILLE, (SE) MO [illegible] NE AR	36.40	89.70	-4.2	V
1947.1215	MEMPHIS, (SW) TN OSCEOLA, (NE) AR	35.60	90.10	-4.2	V
1947.0216	CAIRO, (S) IL [illegible] SE MO	37.00	89.20	-3.2	II-III
1946.1117	CAIRO, (S) IL	37.00	89.20	-4.1	IV
1945.1027	SE MO NW TN [illegible]	36.50	89.50	-3.4	III

YEAR.MODA	LOCALITY	N LAT	W LON	MB	Io
	*** ZONE NMAD ***				
1945.0923	CAIRO, (S) IL HERMONDALE, (SE) MO	36.00	89.80	-3.8	IV
1945.0806	UNION CITY, (NW) TN	36.10	89.70	-3.4	III
1945.0806	CARUTHERSVILLE, (SE) MO/WC TN	36.10	89.70	-3.4	III
1945.0502	MARSTON, (SE) MO	36.50	89.70	-3.8	IV
1944.1223	CARUTHERSVILLE, (SE) MO/NW TN	36.20	89.70	-3.8	IV
1942.0831	CAIRO, (S) IL	37.00	89.20	-3.8	IV
1941.1116	COVINGTON, (WC) TN	35.50	89.70	-4.7	VI
1941.1114	MEMPHIS, (SW) TN	35.10	90.00	-3.8	IV
1941.1026	CAPE GIRARDEAU, (CE) MO/NE AR	36.70	89.70	-3.4	III
1941.1021	CAIRO, (S) IL /WICKLIFFE, (SW) KY	37.00	89.10	-3.8	IV
1941.1008	BLYTHEVILLE, NE AR/NE TN	36.20	89.70	-4.0	IV-V
1941.0827	SE MO	36.70	89.70	-3.4	III
1940.1010	NEW MADRID REGION, (SE) MO/SW KY	36.80	89.20	-3.2	II-III
1940.0919	NEW MADRID REGION, (SE) MO	36.50	89.60	-3.2	II-III
1940.0214	BLYTHEVILLE, (NE) AR/WC TN	35.90	89.80	-3.4	III
1939.0919	TIPTONVILLE, (NW) TN/SE MO	36.40	89.50	-3.4	III
1939.0415	EAST PRAIRIE & NEW MADRID, (SE) MO	36.80	89.40	-3.4	III
1938.0929	MALDEN, (SE) MO	36.50	89.90	-3.4	III
1938.0918	MARKED TREE, (NE) AR	35.50	90.30	-3.2	II-III
1938.0918	MARKED TREE, (NE) AR	35.50	90.30	-3.2	II-III
1938.0917	NE AR	35.50	90.30	-3.0	
1938.0917	NE AR	35.50	90.30	-4.8	IV-V
1938.0617	LU ORA & BURDETTE, (NE) AR/WC TN	35.80	89.90	-3.4	III
1938.0316	NEW MADRID, (SE) MO/NW TN	36.60	89.60	-3.0	II
1937.1005	NEW MADRID, (SE) MO	36.60	89.50	-3.4	III
1937.0623	TIPTONVILLE, (NW) TN	36.40	89.50	-3.4	III
1937.0130	CARUTHERSVILLE, (SE) MO	36.20	89.70	-3.8	IV
1936.1031	NW TN/SE MO	36.60	89.60	-3.0	II
1936.1020	NEW MADRID, (SE) MO/NW TN	36.60	89.60	-3.0	II
1936.0216	HAYTI, (SE) MO/NW TN	36.20	89.70	-3.8	IV
1935.0723	TIPTONVILLE, (NW) TN	36.40	89.50	-3.8	IV
1934.0819	PODNEY, (SE) MO	36.90	89.20	-4.7	VI
1934.0819	CAIRO, (S) IL/WICKLIFFE, (SW) KY	37.00	89.20	-3.2	II-III
1934.0703	RALEIGH & MEMPHIS, (SW) TN	35.20	90.00	-3.8	IV
1933.1209	MANILA, (NE) AR	35.80	90.20	-4.2	VI
1931.1210	BLYTHEVILLE, (NE) AR	35.90	89.90	-3.8	IV
1931.1122	BLYTHEVILLE, (NE) AR/SE MO	36.00	90.20	-3.6	III
1931.0718	NEW MADRID, (SE) MO/NE TN	36.60	89.50	-3.8	IV
1930.0901	HICKMAN, (SW) KY/MARSTON, (SE) MO	36.60	89.40	-4.2	V
1930.0829	BLANDVILLE & BARLOW, (SW) KY/S IL	37.00	89.10	-4.0	IV
1930.0511	NEW MADRID, (SE) MO/NW TN	36.60	89.50	-3.0	II
1930.0402	CARUTHERSVILLE, (SE) MO	36.10	89.70	-3.2	IV
1930.0327	MEMPHIS, (SW) TN	35.10	90.10	-3.8	IV
1930.0219	MARKED TREE, (NE) AR	35.50	90.40	-3.4	III
1929.0512	TIPTONVILLE, (NW) TN	36.40	89.50	-3.8	III
1928.0531	NEW MADRID, (SE) MO/NW TN	36.60	89.50	-3.8	IV
1928.0423	HICKMAN, (SW) KY/NW TN	36.50	89.20	-3.8	IV
1928.0415	NEW MADRID, (SE) MO/NW TN	36.60	89.50	-3.8	IV
1927.0213	TIPTONVILLE, (NW) TN/SE MO	36.40	89.50	-4.4	V
1927.0507	JONESBORO, (NE) AR/W TN	35.70	90.60	-5.3	VII
1927.0419	RIDGELY, (NW) TN/SE MO	36.30	89.50	-4.0	IV
1926.1217	TIPTONVILLE, (NW) TN SE MO	36.40	89.50	-4.0	IV
1926.1213	PARMA, (SE) MO	36.70	89.40	-3.8	III
1926.0427	KENTON, (NW) TN	36.20	89.60	-4.0	IV
1924.0606	TIPTONVILLE, (NW) TN/SE MO	36.40	89.50	-4.2	IV-V
1923.1231	MARKED TREE, (NE) AR/SW KY	35.40	90.30	-4.6	V
1923.1129	CAIRO, (S) IL/SW KY SE MO	37.00	89.20	-3.2	IV
1923.1126	MARKED TREE, (NE) AR	35.50	90.40	-4.1	IV
1923.1029	MARKED TREE, (NE) AR	35.50	90.40	-5.3	VII
1923.0515	CAIRO, (S) IL SW KY/SE MO	37.00	89.20	-3.5	III-IV
1922.0506	CAIRO, (S) IL SW KY/SE MO	37.00	89.20	-3.9	III-IV
1922.0320	MEMPHIS, (SW) TN SE MO/S IL	36.10	89.60	-4.2	IV-V
1921.0827	CAIRO, (S) IL SW KY SE MO	37.00	89.10	-3.5	III
1921.0105	TIPTONVILLE, (NW) TN SE MO	36.40	89.50	-3.8	IV
1919.0523	HICKMAN, (SW) KY SE MO	36.50	89.20	-3.5	III
1919.0523	TIPTONVILLE, (NW) TN SE MO	36.50	89.50	-3.5	III

YEAR.MODA	LOCALITY	N LAT	W LON	MB	Io
	*** ZONE NMAD ***				
1919.0526	CAIRO, (SW) IL/SE MO/SW KY	36.60	89.20	-3.8	III
1919.0524	HICKMAN, (SW) KY/SE MO	36.60	89.20	-3.9	III
1919.0523	HICKMAN, (SW) KY/SE MO	36.60	89.20	-3.9	III
1918.1004	LONOKE CO, (C) AR	34.70	91.70	-4.4	V
1918.0217	CAIRO, (S) IL/SW KY/SE MO	37.00	89.20	-3.6	III
1916.1218	HICKMAN, (SW) KY	36.60	89.20	-4.5	V-VI
1916.0824	CAIRO, (S) IL/SE MO/SW KY	37.00	89.20	-3.8	IV
1916.0521	NEW MADRID, (SE) MO/NW TN (2)	36.60	89.50	-4.1	IV
1915.1207	MOUTH OF OHIO RIVER, (S) IL	36.70	89.10	-4.6	V-VI
1915.1108	MOUND CITY, (S) IL/SW KY/SE MO	37.10	89.20	-3.8	IV
1915.0428	NEW MADRID, (SE) MO/NW TN	36.50	89.50	-4.0	IV-V
1906.1027	CAIRO, (S) IL	37.00	89.20	-4.0	IV-V
1908.0928	NEW MADRID, (SE) MO	36.60	89.60	-4.0	IV
1905.0821	SIKESTON, (SE) MO	36.80	89.60	-5.0	VI-VII
1903.1127	NEW MADRID, (SE) MO	36.50	89.50	-4.2	V
1903.1127	SE MO	36.50	89.50	-4.2	V
1903.1125	NEW MADRID, (SE) MO/NW TN	36.60	89.50	-3.2	II-III
1903.1124	NEW MADRID, (SE) MO/NW TN	36.60	89.50	-3.4	III
1903.1104	NEW MADRID, (SE) MO/S IL	36.90	89.30	-5.3	VII
1903.1104	NEW MADRID, (SE) MO/S IL	36.90	89.30	-4.7	VI
1901.0914	MEMPHIS, (SW) TN/NW MS	35.10	90.00	-3.4	III
1901.0214	SE MO/NE AR	36.00	90.00	-4.2	IV
1898.0614	NEW MADRID, (SE) MO/WC TN	36.00	89.40	-4.5	IV
1898.0126	HELENA, (EC) AR/NW MS	34.60	90.60	-3.8	IV
1895.1117	CHARLESTON, (SE) MO	37.00	89.40	-3.6	III-IV
1895.1102	CHARLESTON, (SE) MO	37.00	89.40	-3.6	III-IV
1895.1102	CHARLESTON, (SE) MO	37.00	89.40	-3.6	III-IV
1895.1101	MEMPHIS, (SW) TN/SE MO	37.00	89.40	-3.8	IV
1895.1031	CHARLESTON, (SE) MO S IL	37.00	89.40	-6.2	IX
1895.1019	NEW MADRID, (SE) MO/NW TN	36.60	89.50	-3.4	III
1895.1017	NEW MADRID, (SE) MO/NW TN	36.60	89.50	-3.4	III
1895.1003	MEMPHIS, (SW) TN/EC AR	35.20	90.00	-3.4	III
1892.0114	MEMPHIS, (SW) TN/NW MS	35.10	90.00	-3.4	III
1891.0114	MEMPHIS, (SW) TN/NW MS	35.10	90.00	-3.6	III-IV
1889.0719	MEMPHIS, (SW) TN/NW MS	35.20	90.00	-3.8	VI
1889.0605	MEMPHIS, (SW) TN/NW MS	35.10	90.00	-3.4	III
1888.1103	MEMPHIS, (SW) TN/NW MS	35.40	90.40	-3.8	IV
1887.0802	CAIRO, (S) IL/SW KY/SE MO	37.00	89.20	-4.7	V
1886.0315	CAIRO, (S) IL/SW KY/SE MO	37.00	89.20	-3.9	III-IV
1886.0717	MAKANDA, (S) IL	37.00	89.20	-4.7	IV
1884.1129	COVINGTON, (WC) TN	35.50	89.70	-4.0	IV
1883.0714	WICKLIFFE, (SW) KY SE MO/S IL	37.00	89.10	-4.1	IV-V
1883.0706	CAIRO, (S) IL/SW KY/SE MO	37.00	89.20	-3.4	III
1883.0611	NW MS/SW TN (3)	35.10	90.00	-4.7	VI
1883.0412	CAIRO, (S) IL SE MO SW KY	37.00	89.20	-4.0	VI
1883.0111	CAIRO, (S) IL/SE MO/SW KY	37.00	89.20	-4.6	VI
1882.0720	CAIRO, (S) IL/SE MO	36.90	89.20	-4.2	V
1881.1007	MEMPHIS, (SW) TN/NW MS	35.10	90.00	-3.8	IV
1880.0713	MEMPHIS, (SW) TN/NW MS	35.30	90.30	-4.1	IV
1879.0925	MEMPHIS, (SW) TN/NW MS	35.30	90.30	-3.9	III-IV
1879.0726	CAIRO, (S) IL/SE MO/SW KY	37.00	89.20	-3.4	II-III
1878.1119	SE MO	36.70	89.30	-4.9	VI
1878.0312	COLUMBUS, (SW) KY/SE MO	36.80	89.10	-4.2	V
1879.0108	CAIRO, (S) IL SE MO SW KY	37.00	89.20	-3.6	III-IV
1877.1119	CAIRO, (S) IL SE MO SW KY	37.00	89.20	-3.6	III-IV
1875.1027	MEMPHIS, (SW) TN/NW MS	35.10	90.00	-3.8	IV
1875.1007	MEMPHIS, (SW) TN SC IL SE MO	36.10	89.60	-4.3	III-IV
1874.0709	CAIRO, (S) IL/SW KY	37.00	89.20	-3.6	III-IV
1873.0922	MEMPHIS, (SW) TN/NW MS	35.10	90.00	-3.2	II-III
1873.0503	NE AR NW TN	36.60	89.60	-4.2	IV
1872.0220	MEMPHIS, (SW) TN NW MS	35.10	90.00	-3.2	II-III
1872.0420	MEMPHIS, (SW) TN NW MS	35.10	90.00	-3.4	III
1872.0205	CAIRO, (S) IL SW KY SE MO	37.00	89.20	-3.5	III
1870.1214	HICKMAN, (SW) KY SE MO	36.60	89.20	-3.6	III-IV
1865.1121	HICKMAN, (SW) KY SE MO	36.60	89.20	-3.4	III
1865.0817	NEW MADRID, (SE) MO NW TN	36.60	89.50	-3.6	III-IV

YEAR.MODA	LOCALITY	N LAT	W LON	M*	Io
	*** ZONE NMAD ***				
1865.0817	NEW MADRID, (SE) MO/NW TN	36.50	89.50	-5.3	VII
1858.0921	LINE SHORE, (SW) KY/NW TN	36.50	89.20	-4.7	VI
1857.0200	NEW MADRID, (SE) MO/NW TN	36.60	89.50	-3.8	IV
1856.1109	NEW MADRID, (SE) MO/NW TN	36.60	89.50	-4.4	IV
1855.0503	CAIRO, (S) IL/SW KY/SE MO	37.00	89.20	-3.4	III
1855.0502	CAIRO, (S) IL/SW KY/SE MO	37.00	89.20	-3.8	IV
1853.1218	HICKMAN, (SW) KY/SE MO	36.60	89.20	-4.5	IV-V
1853.1212	NW TN/SW KY	36.60	89.20	-4.5	IV-V
1853.0828	HICKMAN, (SW) KY/SE MO	36.60	89.20	-3.4	III
1849.0124	HICKMAN, (SW) KY/SE MO	36.60	89.20	-4.2	V
1846.0323	NEW MADRID, (SE) MO/NW TN	36.60	89.60	-3.4	III
1843.0613	HICKMAN, (SW) KY/SE MO	36.60	89.20	-3.4	III
1843.0216	MEMPHIS, (SW) TN/NE AR	35.50	90.50	-4.8	V
1843.0104	MEMPHIS, (SW) TN/NE AR	35.50	90.50	-6.0	VIII
1842.1104	HICKMAN, (SW) KY/SE MO	36.60	89.20	-4.2	V
1842.1104	HICKMAN, (SW) KY/SE MO	36.60	89.20	-4.2	V
1842.0527	SE MO/SW KY	36.60	89.20	-3.8	IV
1842.0327	HICKMAN, (SW) KY	36.50	89.20	-3.7	IV
1841.1227	HICKMAN, (SW) KY/SE MO	36.60	89.20	-4.2	V
1820.0000	SE MO/NW TN	36.60	89.50	-3.6	III-IV
1818.0300	CARUTHERSVILLE, (SE) MO	36.20	89.70	-3.4	III
1816.0725	SE MO	36.50	89.50	-3.6	III
1816.0725	SE MO	36.50	89.50	-3.6	III-IV
1812.0207	NEW MADRID, (SE) MO (1160+ SERIES)	36.50	89.60	-7.4	XII
1812.0123	NEW MADRID, (SE) MO (160+ SERIES)	36.30	89.60	-7.1	XI
1811.1216	NEW MADRID, (SE) MO (550+ SERIES)	36.00	90.00	-7.2	XI
1699.1225	SW TN/NE AR	35.20	90.50	-4.0	V
	*** ZONE WEMB ***				
1979.1105	DALTON, (NE) AR	36.44	91.01	3.2	V
1979.0227	POWHATTAN, (NE) AR (SWA	35.92	91.24	3.1	V
1978.0923	NE AR	36.31	91.14	3.1	
1978.0403	NEW MADRID CO, (SE) MO (2)	36.62	90.00	3.0	
1977.1126	MALVERN, (C) AR	34.52	92.96	3.1	IV
1977.0415	WHITEWATER, (SE) MO	37.22	89.81	2.5	
1974.1212	TUCKER & COY, (C) AR	34.67	91.68	3.4	V
1972.0131	DELAPLAINE, (NE) AR MS=2.5;M*=3.9	36.36	90.84	4.2	VI
1969.0101	LITTLE ROCK, (C) AR MS=3.3	34.80	92.60	4.5	VI
1965.0815	TAMMS & UNITY, (SW) IL (2)	37.40	89.50	3.4	V
1965.0814	SE MO	37.40	89.50	3.4	V
1965.0813	SW IL	37.30	89.50	3.2	IV
1964.0523	SE MO	36.50	90.00	3.6	III
1963.0419	SE MO	36.70	90.10	3.5	
1963.0303	POPLAR BLUFF, (SE) MO MS=4.1	36.70	90.00	4.7	VI
1962.0712	SE MO	36.90	90.00	-3.2	II-III
1954.0202	POPLAR BLUFF, (SE) MO/NE AR	36.70	90.20	-4.4	VI
1947.1201	POPULAR BLUFF, (SE) MO	36.70	90.60	-4.2	IV
1946.0515	DONIPHAN, (SE) MO	36.60	90.80	-4.2	III-IV
1943.1120	NEW MADRID REGION, (SE) MO	36.60	89.70	-3.4	III
1941.1122	CAPE GIRARDEAU, (SE) MO/S IL	37.30	89.50	-3.2	II-III
1940.0204	CAPE GIRARD & COMMERCE, (SE) MO/S	37.20	89.50	-3.4	III
1937.0516	JONESBORO, (NE) AR	36.10	90.60	-4.4	IV-V
1936.1220	CAPE GIRARDEAU, (SE) MO/S IL	37.30	89.50	-3.0	II
1936.1125	SE MO	36.60	90.60	-3.0	II
1936.1123	BUTLER CO, (SE) MO	36.60	90.60	-3.0	II
1933.1024	CAPE GIRARDEAU, (SE) MO S IL	37.30	89.50	-3.4	III
1933.0311	POPLAR BLUFF, (SE) MO	36.70	90.40	-3.8	IV
1933.0311	POPLAR BLUFF, (SE) MO	36.70	90.40	-3.8	IV
1930.0225	CAIRO, (S) IL	37.00	90.20	-3.6	III-IV
1930.0126	BLACK ROCK, (NE) AR	36.10	91.10	-3.8	IV
1928.1225	BLACK ROCK, (NE) AR	36.10	91.10	-3.[illegible]	IV
1928.1110	BLACK ROCK, (NE) AR	36.10	91.10	-3.[illegible]	IV
1928.04[illegible]	CAPE GIRARDEAU, (SE) MO	37.20	89.50	-3.8	IV
1927.[illegible]	POPLAR BLUFF, (SE) MO	36.70	90.40	-3.8	IV
1927.01[illegible]	JACKSON, (SE) MO	37.40	89.70	-4.[illegible]	I

YEAR.MODA	LOCALITY	N LAT	W LON	M*	Io
	*** ZONE WEMB ***				
1926.1027	POPLAR BLUFF, (SE) MO (2)	36.70	90.40	-4.0	IV
1922.0328	POPLAR BLUFF, (SE) MO	36.70	90.40	-4.0	III
1919.1103	POCAHONTAS, (NE) AR	36.30	91.00	-4.0	IV-V
1919.0408	RAVENDEN, (NE) AR	36.20	91.30	-3.6	III-IV
1918.1013	BLACK ROCK, (NE) AR (2)	36.10	91.00	-4.2	V
1917.0609	NEW MADRID, (SE) MO/CAIRO, (SW) IL	36.80	90.40	-4.3	IV
1917.0508	HENDRICKSON, (SE) MO	36.80	90.40	-3.9	III-IV
1917.0508	SE MO	36.80	90.40	-3.4	III
1909.1023	CHARLESTON, (SE) MO	37.00	89.50	-4.6	V
1903.1004	SE MO/S IL	37.00	90.00	-4.6	V-VI
1898.0414	CORNING, (NE) AR	36.40	90.60	-3.0	
1895.1030	CORNING, (NE) AR	36.40	90.60	-3.4	III
1895.1030	CORNING, (NE) AR	36.40	90.60	-3.4	III
1895.1030	CORNING, (NE) AR	36.40	90.60	-3.4	III
1883.1205	POVERTON SPRINGS, (NE) AR	36.30	91.20	-4.2	V
1883.0110	ANNA, (SW) IL/SE MO	37.40	89.30	-3.4	III
1877.0715	NEW MADRID, (SE) MO	36.80	89.70	-4.3	III-IV
1877.0714	SE MO	36.80	89.70	-4.3	III-IV
1877.0714	MEMPHIS, (SW) TN/NW MS	36.80	89.70	-4.3	III-IV
1871.0724	CAIRO, (S) IL/SW KY/SE MO	37.00	90.00	-3.4	III
1820.1109	CAPE GIRARDEAU, (SE) MO/S IL	37.30	89.50	-4.2	V
	*** ZONE OZPK ***				
1979.0912	PARAGOULD, (SE) MO	37.74	89.95	2.5	
1977.0103	APPLETON, (SE) MO (7 AFTER)	37.56	89.75	2.6	
1977.0103	APPLETON, (SE) MO (1 FORE;MAIN)	37.55	89.79	3.4	VI
1976.1213	FLAT RIVER, (SE) MO	37.80	90.24	3.5	V
1975.0924	SE MO	37.23	90.88	2.8	
1975.0924	SE MO	37.23	90.89	2.7	
1974.0811	SE MO	36.92	91.17	3.6	V
1973.0112	ST. FRANCOIS CO, (SE) MO	37.93	90.52	3.2	IV
1972.0609	DESLOGE, (SE) MO	37.70	90.41	3.1	III-IV
1970.0706	LEADWOOD, (SE) MO ML=2.6	37.85	90.58	3.0	II
1970.0205	EC MO	37.90	90.60	3.0	II
1970.0205	EC MO	37.90	90.60	3.2	II
1970.0205	EC MO	37.90	90.60	3.4	II
1969.0120	FREDERICKTOWN, (SE) MO	37.60	90.40	3.4	III
1968.0331	S IL	38.00	89.70	3.5	
1967.0925	SE MO	37.10	91.10	3.1	
1967.0721	POPLAR BLUFF, (SE) MO MS=2.8	37.50	90.40	4.3	VI
1966.0226	SE MO	37.20	91.00	3.7	
1966.0213	SE MO	37.20	90.90	3.1	
1966.0213	SE MO	37.10	91.00	3.6	IV
1965.1209	SE MO	37.40	91.10	3.5	
1965.1104	SE MO	37.10	91.10	3.5	
1965.1103	SE MO	37.10	91.10	3.0	
1965.1020	E MO MS=4.1	37.50	91.00	4.9	VI
1965.0306	CENTERVILLE, (SE) MO	37.40	91.10	4.1	III
1964.0924	SE MO	37.10	91.10	3.0	
1963.0708	SE MO	37.00	90.50	3.1	
1956.1125	WAYNE CO, (SE) MO	37.10	90.60	-4.7	VI
1955.0411	HARRISBURG, (SW) IL	37.70	88.60	-3.0	II
1955.0409	SPARTA, (SW) IL	38.10	89.90	-4.5	VI
1949.0603	STE. GENEVIEVE, (EC) MO	38.10	90.30	-3.4	III
1946.1107	WASHINGTON CO, (EC) MO	38.00	90.70	-3.2	II-III
1946.1007	FRENCH MILLS, (SE) MO	37.50	90.60	-4.4	IV-V
1945.0115	FARMINGTON, (EC) MO	37.80	90.20	-3.8	IV
1944.0925	STE. GENEVIEVE & ST. LOUIS, (EC) MO	37.90	90.00	-4.4	IV
1944.0107	OAKRIDGE, (SE) MO	37.50	89.70	-3.8	IV
1942.0123	HARRISBURG, (SW) IL	37.70	88.60	-3.[illegible]	IV
1939.1123	GRIGGS, (SW) IL	38.20	90.10	-4.9	V
1938.0116	PERRYVILLE, (SE) MO	37.70	89.90	-3.4	III
1937.0118	PERRYVILLE, (SE) MO	37.70	89.90	-3.2	II-III
1934.0515	ST. MARY S, (SE) MO SW IL	37.90	89.90	-3.6	III-IV
1934.[illegible]	ST. MARY S, (SE) MO SW IL	37.90	89.90	-3.4	III

YEAR.MODA	LOCALITY	N LAT	W LON	MB	Io
	*** ZONE OZRK ***				
1933.0803	ST. MARY'S, (SE) MO	37.90	89.90	-3.8	IV
1933.0713	ST. MARY'S, (SE) MO	37.90	89.90	-3.4	III
1929.0226	ARCADIA, (SE) MO	37.60	90.60	-3.8	IV
1921.1001	HARRISBURG, (SW) IL	37.70	88.60	-4.0	IV
1917.0409	DESOTO, (EC) MO/SW IL	38.10	90.20	-5.0	VI
1917.0409	SW IL/EC MO	38.10	90.20	-3.8	IV
1916.0217	NEW BURNSIDE, (SW)IL	37.60	88.50	-3.4	III
1915.0205	HARRISBURG, (SW) IL	37.70	88.60	-3.8	IV
1909.1022	IRONTON, (SE) MO	37.60	90.60	-3.6	IV
1907.0704	FARMINGTON, (EC) MO	37.80	90.40	-3.6	IV-V
1903.1103	MURPHYSBORO, (SW) IL	37.80	89.30	-3.6	III-IV
1903.0206	ST. LOUIS, (EC) MO SW IL	37.80	89.30	-4.8	VI
1884.0815	CALEDONIA, (SE) MO	37.70	90.70	-3.4	III
1883.0729	IRONTON, (SE) MO	37.60	90.60	-4.1	III-IV
1819.0402	SE MO	37.70	89.70	-4.2	V
1795.0108	KASKASKIA, (SW) IL EC MO WC KY	37.90	89.90	-4.0	V
	*** ZONE NEMA ***				
1969.0630	SE KS	37.40	97.00	3.0	
1943.0403	BEECHWOOD & WICHITA, (SE) KS (2)	37.70	97.30	-3.8	IV
1935.0322	SE NE	40.30	96.10	-3.6	IV
1935.0301	TECUMSEH, (SE) NE	40.30	96.20	-5.3	VII
1935.0301	TECUMSEH, (SE) NE	40.30	96.20	-3.0	
1934.1107	JOHNSON, (SE) NE	40.00	96.00		III
1929.1207	MANHATTAN, (NE) KS	39.20	96.60	-4.2	V
1929.1023	JUNCTION CITY, (NE) KS	39.00	96.80	-3.2	II-III
1929.1021	JUNCTION CITY & MANHATTAN, (NE) KS	39.20	96.50	-4.2	V
1929.0923	MANHATTAN, (NE) KS	39.00	96.60	-4.0	V
1929.0923	MANHATTAN, (NE) KS	39.00	96.60	-4.2	V
1919.0726	WICHITA, (SE) KS	37.70	97.30	-3.4	III
1919.0726	WICHITA, (SE) KS	37.70	97.30	-3.6	IV
1919.0526	WICHITA, (SE) KS	37.70	97.30	-4.2	IV
1906.0123	MANHATTAN, (NE) KS	39.30	96.60	-3.4	III
1906.0123	MANHATTAN, (NE) KS	39.30	96.60	-3.4	III
1906.0119	MANHATTAN, (NE) KS	39.30	96.60	-3.4	III
1906.0115	MANHATTAN, (NE) KS	39.30	96.60	-3.6	IV
1906.0114	MANHATTAN, (NE) KS	39.30	96.60	-3.2	II-III
1906.0109	MANHATTAN, (NE) KS	39.30	96.60	-5.0	VII
1906.0109	MANHATTAN, (NE) KS	39.30	96.60	-3.0	
1906.0108	MANHATTAN, (NE) KS	39.30	96.60	-5.5	VII-VIII
1906.0108	MANHATTAN, (NE) KS	39.30	96.60	-3.2	II-III
1906.0109	MANHATTAN, (NE) KS	39.30	96.60	-3.2	II-III
1875.1209	NEBRASKA CITY, (SE) NE/SW IA	40.70	95.80	-3.4	III
1867.0428	NEBRASKA CITY, (SE) NE/SW IA	40.70	95.80	-3.6	IV
1867.0424	WAMEGO & LAWRENCE, (NE) KS	39.50	96.70	-5.3	VII
	*** ZONE CUS ***				
1979.1011	SC MO	36.72	91.30	2.6	
1978.092[illegible]	ST LOUIS, (EC) MO	38.57	90.28	3.2	VI
1978.0216	TUSCOLA, (EC) IL	39.80	88.23	2.7	
1977.0617	CELINA, (WC) OH	40.71	84.58	3.2	VI
1977.0[illegible]	EFFINGHAM CO, (EC) IL	39.17	88.40	2.9	
1976.0613	INDIANAPOLIS, (C) IN (2)	40.00	86.00		II
[illegible]76.0415	CROFTON, (SW) KY	37.40	87.30	3.3	V
1976.0405	STINESVILLE, (WC) IN	39.35	86.66	3.0	V
1974.1213	SE MO NE AR ML=2.2	36.70	91.[illegible]	2.6	
1974.1125	ATTICA, (WC) IN	40.30	87.40	2.4	II
1974.0922	SW IL	38.[illegible]	89.73	2.5	IV
1974.[illegible]	SW IL	[illegible]	[illegible]	3.6	V
1974.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	VI
1974.[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	I
1974.[illegible]	AUGUSTA, (EC) MO	[illegible]	[illegible]	[illegible]	II
1974.[illegible]	SW IL	[illegible]	[illegible]	[illegible]	III
1973.[illegible]	ST. CLAIR CO, (SW) IL	[illegible]	[illegible]	2.5	II

YEAR.MODA	LOCALITY	N LAT	W LON	MB	Io
	*** ZONE CUS ***				
1973.0107	MADISONVILLE, (WC) KY	37.44	87.30	3.2	
1972.0914	NC IL MS=3.3	41.59	89.42	4.4	VI
1965.1211	LOUISVILLE, (NC) KY	38.30	85.80	3.0	V
1967.0805	CEDAR HILL & ST. LOUIS CO, (EC) MO	38.30	90.60	2.3	II
1966.1206	C MO	38.90	92.60	3.0	
1965.0214	SW MO	36.90	93.30	3.0	
1963.1214	BEECHMONT, (SW) KY	37.20	87.10	-3.4	III
1963.1205	WC KY	37.20	87.00	3.2	II-III
1961.1225	WC MO/NE KS	39.10	94.60	-3.6	IV
1961.1225	WC MO/NE KS	39.10	94.60	-3.8	V
1961.0909	NE AR SE MO	36.40	91.30	-3.6	IV
1959.0812	N AL SC TN	35.00	87.00	4.7	VI
1959.0812	HANAL GREEN, (NW) AL	35.00	87.00		VI
1959.0106	NORTH ST. LOUIS CO, (EC) MO	38.70	90.30	-3.4	III
1957.0423	BIRMINGHAM, (NC) AL	34.50	86.75		VI
1956.0909	COLLEGE GROVE, (C) TN	35.80	86.70	-3.6	IV
1956.0313	FULTON CO, (WC) IL	40.50	90.40	-3.3	IV
1953.0911	SC ANA, (SW) IL	33.80	90.10	-4.7	III
1952.0107	DEWITT CO & MCCLEAN CO, (EC) IL	40.20	88.50	-3.4	III
1951.0919	COLLINSVILLE EDWARDSVILLE, (SW) IL	38.70	89.90	-3.6	IV
1950.0916	MISSISSIPPI CO, (NE) AR	35.70	89.90	-3.8	III-IV
1950.0203	LEBANON, (SW) MO	37.70	92.70	-4.2	V
1949.0226	DEFIANCE, (EC) MO	38.60	90.70	-3.4	III
1949.0311	CLAYTON, (EC) MO	38.60	90.30	-3.2	II-III
1948.0420	IOWA CITY, (SE) IA	41.70	91.80	-3.6	IV
1947.0629	ST. LOUIS, (EC) MO	38.40	90.20	-4.7	VI
1945.0521	ST. LOUIS, (EC) MO	38.60	90.20	-3.8	IV
1945.0327	ST. LOUIS, (EC) MO	38.60	90.20	-3.4	III
1943.0609	WEBSTER GROVES, (EC) MO	38.60	90.40	-3.6	III-IV
1943.0524	WEST ALTON, (EC) MO SW IL	38.90	90.20	-3.0	II
1943.0520	WEST ALTON, (EC) MO SW IL	38.90	90.20	-3.0	II
1943.0418	WATERLOO, (SW) IL/SC IN	35.30	85.80	-3.6	IV
1943.0415	LOUISVILLE, (NC) KY/SC IN	38.30	85.80	-3.8	IV
1942.1227	MAPLEWOOD, (EC) MO	38.60	90.30	-3.2	II-III
1942.1117	SW IL EC MO	38.60	90.20	-3.0	
1942.1117	EAST ST. LOUIS, (W) IL	38.60	90.20	-3.6	IV
1942.0301	EUDA & KEWANEE, (NC) IL	41.20	89.70	-4.0	IV-V
1942.0130	ST. LOUIS, (EC) MO	38.70	90.30	-3.0	
1942.0129	ST. LOUIS, (EC) MO SW IL	38.30	90.40	-3.0	
1942.0127	EC MO	38.60	[illegible].40	-3.0	II
1942.0114	ST. LOUIS, (EC) MO SW IL	38.40	[illegible].30	-3.4	III
1942.0000	WINFIELD, (EC) MO	38.60	90.40		III
1941.1115	WATERLOO, (SW) IL EC MO	38.30	90.20	-3.4	III
1941.0100	WINFIELD, (EC) MO	39.00	90.70	-3.0	III
1940.0527	LOUISVILLE, (NC) KY SC IN	38.20	85.80	-3.2	II-III
1940.0103	LOUISVILLE, (NC) KY/SC IN	38.30	85.80	-3.4	III
1939.1124	DAVENPORT, (EC) IA	41.60	90.60	-3.2	II-III
1939.0624	HUNTSVILLE, (NC) AL	34.70	86.60	-3.0	IV
1939.0624	HUNTSVILLE, (NC) AL	34.70	86.60	-3.6	IV
1939.0624	HUNTSVILLE, (NC) AL	34.70	86.60	-3.0	
1937.1016	CINCINNATI, (SW) OH	39.10	84.50	-3.4	III
1937.0205	ST. LOUIS, (EC) MO NW IL	38.70	90.10	-3.4	III
1937.0629	PEORIA, (C) IL	40.70	89.60	-3.0	II
1936.1225	CINCINNATI, (SW) OH/NC KY	39.10	84.50	-3.4	III
1936.1225	CINCINNATI, (SW) OH/NC KY	39.10	84.50	-3.4	III
1935.1029	PIKE CO, (WC) IL	39.60	90.30	-3.0	
1935.0226	BURLINGTON, (SE) IA	40.80	91.10	-3.4	III
1935.0120	PAWNEE, (NC) MO SC IA	40.50	94.00	-3.4	III
1935.0105	DAVENPORT, (EC) IA NW IL	41.50	90.60	-4.2	IV
1935.0105	NW IL EC IA	41.50	90.60	-3.4	III
1934.1112	ROCK ISLAND, (NW) IL	41.50	90.50	-4.7	VI
1934.1029	[illegible]ILLE, (SE) IL	37.50	88.50	-3.6	IV
1933.1116	[illegible], (EC) MO	38.60	90.60	-3.3	IV
1931.1217	ST. LOUIS, (EC) MO	[illegible]	90.20	-3.0	II
1931.1127	[illegible]ILLE, [illegible]	[illegible]	[illegible]	-3.4	III
1931.[illegible]	[illegible], KANSAS CITY, [illegible]	[illegible].10	94.70	-4.	[illegible]

YEAR.MODA	LOCALITY	N LAT	W LON	MS	Io
	••• ZONE CUS •••				
1931.0809	TURNER & KANSAS CITY, (NE) KS	39.10	94.70	-3.0	V--I
1931.0809	TURNER & KANSAS CITY, (NE) KS	39.10	94.70	-3.0	V--I
1931.0105	ELLISTON, (SW) IN	39.00	87.00	-4.2	V
1930.1223	FERN GLEN & ST. LOUIS, (EC) MO	38.50	90.70	-3.5	IV
1930.0808	HANNIBAL, (NE) MO	39.70	91.40	-3.5	IV
1930.0528	HANNIBAL, (NE) MO	39.70	91.40	-3.4	III
1929.0317	ST. LOUIS, (EC) MO/SW IL	38.60	90.20	-3.3	II
1928.0306	COLUMBIA & FRANKLIN, (C) TN	35.60	87.00	-3.4	II-III
1928.0123	MOUNT CARROLL, (NW) IL	42.00	90.00	-3.5	IV
1927.0318	WHITE CLOUD, (NE) KS	39.90	95.30	-4.2	VI
1925.0713	EDWARDSVILLE, (SW) IL	38.50	90.00	-4.2	V
1925.0703	HARRISON & ALPENA, (NC) AR	36.20	93.20	-3.6	IV
1925.0404	CINCINNATI, (SW) OH/NC KY	39.10	84.50	-3.0	
1925.0127	EVENING SHADE, (NC) AR	36.20	91.70	-3.2	III
1923.1129	CALHOUN, (WC) KY	37.50	87.30	-3.4	III
1923.1109	TALLULA, (C) IL	40.00	89.90	-4.2	V
1923.0327	WAYATTE, (NW) MS	34.60	89.70	-3.9	III-IV
1923.0308	GREENVILLE, (SE) IL	38.90	89.40	-3.9	III-IV
1922.0410	MONMOUTH, (WC) IL	40.90	90.60	-3.0	II
1922.0329	FARMINGTON, (C) TN	35.50	86.70	-3.2	IV
1921.1009	WATERLOO, (SW) IL	38.30	90.10	-3.2	III
1921.1009	WATERLOO, (SW) IL	38.30	90.10	-3.4	III
1921.0921	C TN	36.00	86.10	-3.4	III
1921.0908	WATERLOO, (SW) IL	38.30	90.10	-4.0	IV
1921.0908	WATERLOO, (SW) IL	38.30	90.10	-3.0	
1921.0902	STATESVILLE, (C) TN	36.00	86.10	-3.0	III
1921.0902	NC TN	36.20	86.30	-3.4	III
1921.0314	CRAWFORDSVILLE, (WC) IN/EC IL	39.50	87.50	-4.4	IV
1920.1003	HARRISONVILLE, (WC) MO	38.60	94.30	-3.2	III
1920.0507	NW TN	36.30	88.20	-3.2	II
1920.0501	MOUNT VERNON, (SW) IL/EC MO	38.50	89.50	-4.3	IV--
1920.0501	COLUMBIA, (SW) IL	38.50	89.50	-3.0	
1920.0228	SPRINGFIELD, (SW) MO	37.20	93.30	-4.3	IV
1918.1015	SW TN	35.20	89.20	-4.5	-
1918.0701	HANNIBAL, (NE) MO	39.70	91.40	-3.2	IV
1917.0125	WILLIAMSON CO, (C) TN	35.90	86.90	-3.5	II
1916.0107	WORTHINGTON, (SW) IN	39.10	87.00	-3.6	III
1913.1111	LOUISVILLE, (NC) KY/SC IN	38.20	85.80	-3.2	IV
1912.1016	STERLING, (NC) IL	41.80	89.70	-3.6	III-IV
1912.0609	HUMBOLDT, (WC) TN/NE AR	35.80	88.90	-3.9	III
1912.0102	AURORA/MORRIS/YORKVILLE, (NE) IL	41.50	88.50	-4.7	VI
1911.0228	KENWOOD SPRINGS, (EC) MO/SW IL (2)	38.70	90.30	-3.2	IV
1909.1022	SCOTT, (NC) KY	38.90	84.50	-3.6	
1909.1022	STERLING, (NC) IL	41.80	89.70	-4.0	I---
1909.0927	TERRE HAUTE, (SW) IN (2)	39.50	87.40	-5.2	VII
1909.0922	OHIO VALLEY, (SC) IN	38.70	86.50	-4.2	V
1909.0516	WATERLOO, (SW) IL	38.30	90.10	-4.3	IV
1909.0718	SPRINGFIELD & HAVANA, (C) IL	40.20	90.00	-5.3	VII
1908.1112	SEDALIA, (WC) MO	38.70	93.20	-3.2	IV
1907.1210	ST. LOUIS, (EC) MO SW IL	38.60	90.20	-3.2	IV
1907.0130	GREENVILLE, (SE) IL	38.90	89.50	-4.2	V
1907.0129	SPENCER & DANVILLE, (WC) IN	39.50	86.60	-4.2	V
1906.1123	ANABEL, (NE) MO	39.70	92.30	-3.4	III
1906.0913	GREENCASTLE, (WC) IN	39.70	86.80	-3.2	I-
1906.0909	COLUMBUS, (EC) IN	39.20	85.90	-3.2	[illegible]
1906.0508	SHELBY CO & BARTHOLOMEW CO, (EC) IN	39.50	85.80	-3.2	III-I-
1906.0306	HANNIBAL, (NE) MO	39.70	91.40	-3.2	I-
1906.0222	ANABEL, (NE) MO	39.70	92.30	-3.4	III
1905.0922	QUINCY, (WC) IL NE MO	39.90	91.40	-3.2	II-III
1905.0413	KEOKUK, (SE) IA	40.40	91.60	-4.0	
1903.1211	EFFINGHAM, (EC) IL	39.10	88.50	-3.0	II
1903.1120	MORGANTOWN, (WC) IN	39.40	86.30	-3.4	III
1903.0920	MORGANTOWN, (WC) IN	39.40	86.30	-3.2	I-
1903.0317	WILLISFORD, (C) IL	39.10	89.50	-3.6	III-I
1903.0113	BALDWIN, (EC) IL	38.20	89.80	-3.[illegible]	II
1903.0124	ST. LOUIS, (EC) MO & IL	38.6	[illegible]	-4.7	[illegible]

YEAR.MODA	LOCALITY	N LAT	W LON	MS	Io
	••• ZONE CUS •••				
1901.0103	ELDORADO SPRINGS, (WC) MO	37.60	94.00	-4.2	V
1899.1201	NEOSHO, (SW) MO	36.80	94.40	-3.8	IV
1898.0329	MT. HERMAN, (SC) KY	36.80	85.60	-3.4	III
1897.1202	KANSAS CITY, (EC) KS/NE OK	38.00	95.00	-4.5	IV
1895.0727	SAVANNAH, (SW) TN/NW MS	35.20	88.30	-3.6	III-IV
1895.0719	MEMPHIS, (SW) TN	35.00	90.00		VI
1894.0718	MEMPHIS, (SW) TN/NW MS	35.00	90.00	-3.4	III
1889.0606	NUNNELLY & MILAN, (WC) TN	35.90	88.10	-3.9	III-IV
1886.0813	INDIANAPOLIS, (WC) IN	39.70	86.10	-3.6	III-IV
1886.0301	BUTLERVILLE, (SE) IN	39.00	85.50	-3.6	III-IV
1885.1226	BLOOMINGTON, (C) IL	40.40	89.00	-3.4	III
1885.0221	CARTHAGE, (SW) MO/SE KS	37.20	94.30	-3.4	III
1884.0331	COLLEGE HILL, (SW) OH	39.50	84.70	-3.0	II
1883.1114	ST. LOUIS, (EC) MO/SW IL	38.70	90.20	-3.8	IV
1882.1115	ST. LOUIS, (EC) MO/SW IL	38.60	90.20	-3.6	III
1882.1022	GREENVILLE, (SE) IL	38.90	89.40	-3.4	III
1882.1015	WC IL	39.00	89.50	-4.2	V
1882.1014	WC IL/EC MO	39.00	89.50	-4.2	V
1882.0927	WC IL	39.00	89.50	-4.7	IV
1881.0527	LASALLE, (NC) IL	41.30	89.10	-4.7	IV
1881.0519	LAWRENCE, (EC) KS	38.90	95.20	-3.4	III
1880.1130	ASHWOOD, (C) TN	35.60	87.30	-3.4	III
1877.0603	STANFORD, (C) KY	37.50	85.70	-3.4	III
1875.1108	TOPEKA & VALLEY FALLS, (NE) KS	39.30	95.50	-4.2	V
1872.0708	CHILLICOTHE, (NC) MO	39.80	93.50	-3.8	IV
1871.0725	ST. CLAIR CO, (SW) IL	38.50	90.00	-3.6	III
1869.0220	LEXINGTON, (NC) KY	38.10	84.50	-4.2	V
1854.0306	NC KY	38.20	85.20	-3.9	IV
1854.0229	EC KY	37.60	84.50	-4.2	IV-V
1850.0404	LOUISVILLE, (NC) KY/SC IN	38.30	85.80	-4.2	V
1843.0809	COLUMBIA & SOMERVILLE, (WC) TN	35.30	88.20	-4.2	III-IV
1843.0216	ST. LOUIS, (EC) MO	38.60	90.20	-4.0	IV
1834.1120	NC KY	38.00	85.00	-4.2	V
1829.0500	JACKSON, (WC) TN	35.60	88.80	-3.0	
1827.0814	ST. LOUIS, (EC) MO/WC IL	38.60	90.20	-3.4	III
1827.0807	NEW ALBANY, (SE) IN/NC KY	38.30	85.80	-4.7	VI
1827.0806	NEW ALBANY, (SE) IN/NC KY	38.30	85.80	-4.7	VI
1827.0705	NEW ALBANY, (SE) IN/NC KY	38.30	85.80	-4.2	IV
1819.0917	CAPE GIRARDEAU, (SE) MO/SW IL	38.10	89.60	-3.6	IV
1819.0916	CAPE GIRARDEAU, (SE) MO/SW IL	38.10	89.30	-3.5	IV
1818.0411	SC IL	38.60	90.20	-3.6	IV

APPENDIX B

Recurrence Statistics

1. Text.
2. Zonal Catalogs.
   a. Date List of Earthquakes by Ten Year Intervals.
      M - magnitude intervals: M=1 (m_b=3.0-3.4), M=2 (m_b=3.5-3.9), etc.
      # - ordinal number for M in reverse chronological sequence.
      * - earthquake occurrence within 15 days of the previous event.
      Ø - earthquake of m_b < 3.0 (event not used in calculations.)
   b. Recurrence List by Magnitude Intervals.
      # - ordinal number for M in reverse chronological sequence.
      P(yr) - period of time (in years) before 1 January 1980.
      T(yr), T(da) - average time interval between earthquakes within the same magnitude interval in years, T(yr), and days, T(da).
      s(T)(da) - standard deviation of T in days.
      R(#/yr) - rate of recurrence (inverse of T) in events per year for each M.
   c. Completeness Graphs.
      T and s(T) vs. P - minimum values of T and s(T) for each M yields the estimate for the period of completeness.
   d. Ten Year Listings (by magnitude, recurrence rate, intensity).
   e. Recurrence Statistics Table.
      log Nc - logarithm of the cumulative exceedence probability.
      a - log Nc intercept of the recurrence formula (log Nc @ m_b = 0).
      b - slope of the recurrence formula.
      r - coefficient of correlation of the recurrence formula.
      s(e) - standard error of estimate of m_b on log Nc.
      Nc(cal)(m_b=3) - calculated Nc value (from recurrence formula) for m_b=3.
      m_b(cal)(Nc=E-3) - calculated m_b value (from recurrence formula) for Nc=0.001.
   f. Recurrence Curve Graph. log N_i vs m_b.

Estimates of earthquakes expected to recur in the future were utilized in assessing preliminary seismotectonic zones, uniqueness of final zones, maximum credible earthquakes (MCE) for each zone, and operating basis earthquakes (OBE) for each zone. Earthquake recurrence was evaluated by statistical resolution of the known earthquakes which have occurred in the zone.

The MCEs for the final zones were not statistically determined values. The MCE for a zone was selected by comparing the geologic features, tectonic framework, relative seismicity among the zones, and recurrence relations for that zone. Considerable judgment by the review group was required to interrelate sparse, reliable information with empirical relations and subjective tests. In no case was a single indicator allowed to outweigh other evaluations pertinent to the MCE. The OBE, by definition, should be less intense than the MCE of the same zone. The OBE for each zone was based on the seismic history and the certainty of occurrence of earthquakes.

An equation was determined relating body-wave magnitude (m_b) and maximum Modified Mercalli Intensity (I_o) for a variety of purposes. A list of 139 earthquakes (Appendix A) defined in both units of m_b and I_o was utilized to produce a linear regression by least square error. The fit was constrained to the point for the largest event of the New Madrid 1811/1812 series: $m_b = 7.4$, I_o = XI-XII (11.5). The relation is

$$(I_o)_{calculated} = -2.202 + 1.852\ m_b,\ \text{or} \quad (1)$$

$$(m_b)_{calculated} = 1.189 + 0.540\ I_o. \quad (2)$$

The standard deviation of I_o on m_b is 0.802. The coefficient of correlation for I_o on m_b is 0.822. These equations were used within the study area for estimating values of historic events and predicting intensities from magnitude-recurrence curves.

Seventeen separate literature references were used to compile a complete data base of historic earthquakes greater than $m_b = 3$ (Appendix A). Over 1,000 individual events have been noted within the study area since the year 1800. Magnitude and intensity estimates were assigned to many noninstrumented events based on work by Nuttli (1974a, 1979c) or by equations (1) and (2).

Each event of the historic list of earthquakes was assigned by location to a zone. Swarms, foreshocks and aftershocks were eliminated from the zone listings of historic earthquakes, such that only the largest (primary) event of a group of related earthquakes was itemized. Chiburis (1979) recommended the procedure of deleting smaller events within a short time period for similar locations. The list of main earthquakes for each final zone is itemized in Appendix A.

The zones were analyzed for the amount of time the record of past earthquakes was complete for intervals of body-wave magnitude by methods of Stepp (1973), Nuttli (1974a), and Chiburis (1979). The period to which the data is complete may be assessed graphically: graph (for each magnitude

interval) logarithmic values of both the mean time period per earthquake, t, and the sample deviation of this mean period, s(t), against period in years. For a sufficient number of events within a magnitude interval, t and s(t) should be minima near the date of record completeness. Tables of magnitude and intensity, curves of t and s(t), zonal listings of recurrence statistics, and graphs of recurrence relationships are contained herein for each final zone.

Recurrence estimates may be assessed for each zone from the number of events and the period of completeness for the magnitude intervals. Occurrence probability for any interval is the number of main events divided by the period of completeness. The likelihood that a magnitude interval will be exceeded is called the annual exceedance probability, N, and is the sum of all the occurrence probabilities for intervals greater than and equal to the magnitude interval assessed. (For the Central US Zone which is 544,000 square kilometers in area, the N values are reduced by a factor of 5.44 to normalize its area to 100,000 square kilometers.) Engineering risk for an earthquake of a given magnitude is equivalent to the annual exceedance probability for that magnitude. The mean return period for a given event is the inverse of N at the same m_b. The magnitude relation to annual exceedance probability is defined by

$$m_b = \alpha + \beta \log N, \qquad (3)$$

where α is the magnitude intercept, and β is the line slope. This form of the equation is used because the exceedance probability is known accurately via dates of occurrence, while magnitude values are less well known estimates (Neville & Kennedy, 1964). Regression fits of equation (3) are resolved into the common form,

$$\log N = a + b\, m_b \qquad (4)$$

where $a = -\alpha/\beta$ and $b = 1/\beta$. Lastly, equations (3) and (4) were corrected by procedures of Herrmann (1977). This method adjusts the incremental data to cumulative exceedance probability before computing magnitude-recurrence relationships.

The design earthquakes for a zone are evaluated in part via regression fits and confidence limits on the m_b, N data. Four linear fits of the data were considered: least square regression, regression constrained to a point by least square error analysis, regression constrained to a slope by least square error analysis, and least square regression of weighted (duplicate point) data. Linear regression is the best objective fit of a data set. When the fit was constrained to a point, the constraining point was m_b = MCE and log N = -3 (the MCE occurring once in 1,000 years). When the fit was constrained to a slope, the slope used was b = 0.92. Nuttli & Herrmann (1978b) recommend this slope for the entire central U.S. This assumption was applied to each zone by finding the best line fit for that slope. The last type of linear match was the weighted fit of data, similar to that utilized by Nuttli (1974a). Note that recurrence lineations are slightly different than the exact fits due to the adjustment for incremental

data to cumulative exceedance probability regressions. Graphs of recurrence curves for each zone are shown in this appendix.

A variety of statistics were determined to evaluate the strength of the linear fits for each zone. The coefficient of correlation, r, and the standard error of estimate on m_b, s(e), were resolved for lines which did not have negative values within a square root (Maksoudian, 1969). A "t distribution" assessment (Neville & Kennedy, 1964) was used to determine the confidence bands of the mean magnitudes and the slopes, and significance tests for a theoretical slope value. Significance tests on the theoretical slope of b = -0.92 compared with the least square fit indicate that the Southern Illinois-Wabash Zone has a linear regression slope significantly different than the theoretical one. The East Embayment and West Embayment each have linear regressions very similar to b = -0.92 for the least square fit.

The St. Louis District has chosen the OBE to be based upon the 100-year earthquake with a 95 percent statistical confidence by "t distribution" assessment. Utilizing these recurrence statistics (Neville & Kennedy, 1964), a sample value of the OBE for any fit can be computed by

$$obe_{sample} = \alpha - 2\beta + t_{n-2,10\%}\left[1 + n^{-1} + \frac{(-2 - \overline{\log N})^2}{\Sigma(\log N_i - \overline{\log N})^2}\right]^{1/2} \quad (5)$$

where α, β and N are defined in equation (3),

t is the t distribution value for a 5 percent upper bound,

n is the number of data points, and

i represents an individual data value from 1 to n.

The value of this earthquake (sample OBE) was computed from the recurrence curve through the MCE at 1000 years. The chosen OBE, in comparison with the 95 percent confidence 100-year event (sample OBE), was not allowed to be greater than the 500-year event on the same curve. The 500-year earthquake has only an 18 percent likelihood of being exceeded in any 100 year period. The chosen OBE also was restricted to be greater than the largest historic event (last 160 years).

The variety of recurrence data parameters for each final zone are listed in this appendix.

The MCE and OBE for each zone are specified by both m_b and I_o. The second significant digit for the m_b of the design event is given in order that estimates of ground shaking may be confined to a sufficiently narrow band. The intensity of the design earthquakes was determined by equation (1) and specified in Roman numerals. A negative (-) or positive (+) sign is utilized when the design values are just smaller or greater, respectively, than the specified intensities. A range of Modified Mercalli intensities is used for I_o when the calculated design values are midway between two intensities.

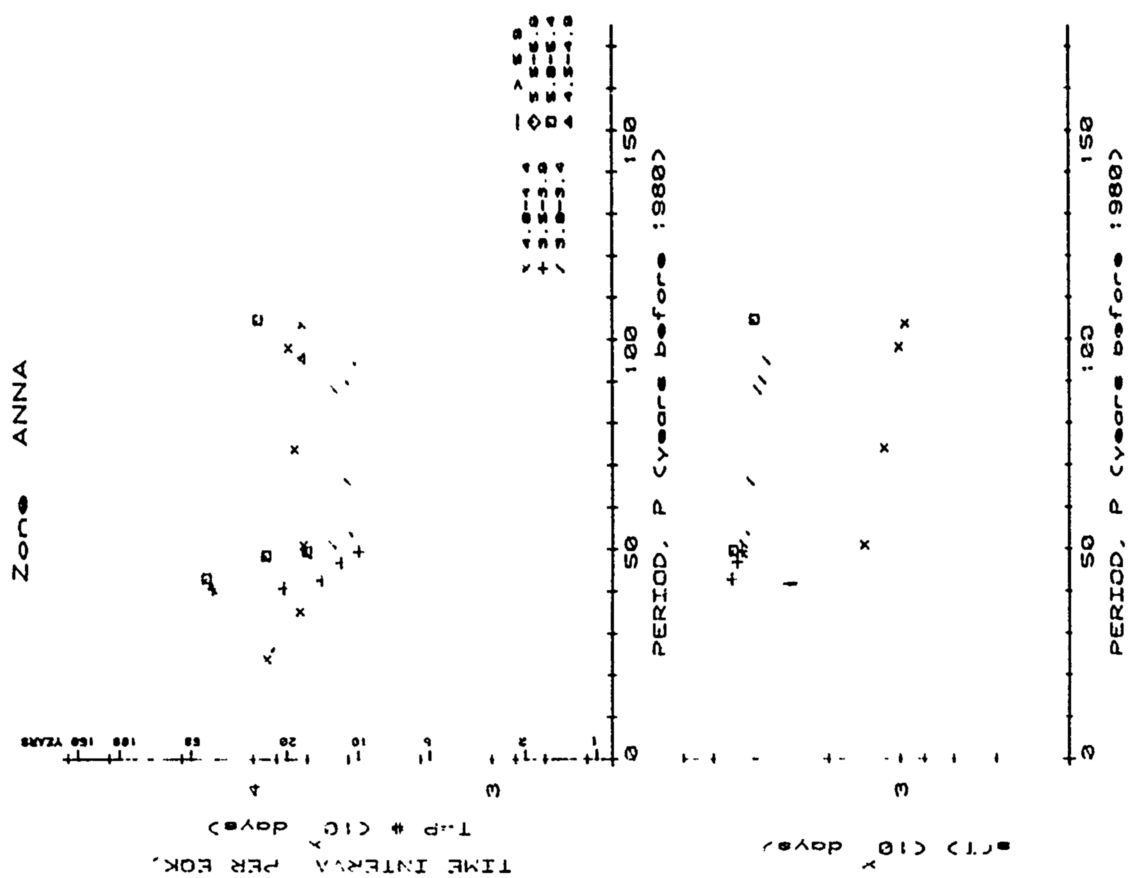
ANNA, OHIO

Zone: ANNA　　　Date List

	Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#
	1956. 127	3-	1		1944.1113	3-	2		1939. 7 9	1-	1		1939. 617	2-	1
	1939. 318	1-	2	*	1939. 318	2-	2		1937. 5 2	2-	3	*	1937. 427	1-	3
*	1937. 423	1-	4		1937. 3 9	5-	1	*	1937. 3 3	3-	3	*	1937. 3 3	1-	5
*	1937. 3 2	5-	2		1933. 222	2-	4		1931.10 8	1-	6		1931. 920	5-	3
	1931. 331	1-	7	*	1931. 321	1-	8		1930.10 0	2-	5	*	1930. 930	5-	4
*	1930. 929	1-	9		1930. 627	2-	6	*	1930. 626	2-	7		1929. 3 8	3-	4
	1928.1027	1-	10		1925.10 0	1-	11		1914. 0 0	1-	12		1906. 423	3-	5
	1892. 023	1-	13		1809. 9 0	1-	14		1884.1223	1-	15		1884. 919	4-	1
	1882. 2 9	3-	6		1876. 6 0	3-	7		1875. 618	5-	5				

Zone: ANNA　　　Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
RANGE mb:		3.0-3.4									
1	40	40	14785		0.025	2	48	24	8808		0.041
3	49	16	5939	4513	0.062	4	51	13	4673	4501	0.078
5	54	11	3963	4405	0.092	6	66	11	4018	4208	0.091
7	88	13	4592	3950	0.080	8	98	11	4124	3767	0.089
9	95	11	3856	3622	0.095						
RANGE mb:		3.5-3.9									
1	41	41	14807		0.025	2	41	20	7449		0.049
3	43	14	5194	5027	0.070	4	47	12	4278	4773	0.085
5	50	10	3617	4562	0.101						
RANGE mb:		4.0-4.4									
1	24	24	8739		0.042	2	35	18	6416		0.057
3	51	17	6187	1412	0.059	4	74	18	6729	1169	0.054
5	98	20	7151	1014	0.051	6	104	17	6306	956	0.058
RANGE mb:		4.5-4.9									
1	95	17	6306		0.058						
RANGE mb:		5.0-5.4									
1	43	43	15637		0.023	2	48	24	8817		0.041
3	49	16	5996	4957	0.061	4	105	26	9545	4058	0.038



10 YEAR LISTING of Earthquakes by Magnitude

*** ZONE ANNA ***

YEAR \ mb	<3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979								
1960-1969								
1950-1959				1				
1940-1949				1				
1930-1939		3	5			3		
1920-1929		2		1				
1910-1919		1						
1900-1909				1				
1890-1899		1						
1880-1889		2		1	1			
1870-1879				1		1		
1860-1869								
1850-1859								
1840-1849								
1830-1839								
1820-1829								
1810-1819								
1800-1809								
1790-1799								
SUMS	0	9	5	6	1	4	0	0

# of events = 25
EARLY YEAR = 1875
MIN mb = 3.0

RECENT YEAR = 1956
MAX mb = 5.3

10 YEAR LISTING of Recurrence Rate, R (#/yr), by Magnitude

*** ZONE ANNA ***

YEAR \ mb	<3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979								
1960-1979								
1950-1979				0.033				
1940-1979				0.050				
1930-1979		0.060	0.100	0.040		0.060		
1920-1979		0.083	0.083	0.050		0.050		
1910-1979		0.086	0.071	0.043		0.043		
1900-1979		0.075	0.063	0.050		0.038		
1890-1979		0.078	0.056	0.044		0.033		
1880-1979		0.090	0.050	0.050	0.010	0.030		
1870-1979		0.082	0.045	0.055	0.009	0.036		
1860-1979		0.075	0.042	0.050	0.008	0.033		
1850-1979		0.069	0.038	0.046	0.008	0.031		
1840-1979		0.064	0.036	0.043	0.007	0.029		
1830-1979		0.060	0.033	0.040	0.007	0.027		
1820-1979		0.056	0.031	0.038	0.006	0.025		
TOTAL #	0	9	5	6	1	4	0	0

10 YEAR LISTING of Earthquakes by max MM Intensity

*** ZONE ANNA ***

YEAR \ Io	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1970-1979												
1960-1969												
1950-1959					1							
1940-1949			1									
1930-1939		1	2	5			2	1				
1920-1929			2		1							
1910-1919			1									
1900-1909					1							
1890-1899			1									
1880-1889			2		1	1						
1870-1879					1		1					
1860-1869												
1850-1859												
1840-1849												
1830-1839												
1820-1829												
1810-1819												
1800-1809												
1790-1799												
SUMS	0	1	9	5	5	1	3	1	0	0	0	0

# of events = 25
EARLY YEAR = 1875
MIN Io = II

RECENT YEAR = 1956
MAX Io = VIII

ZONE: Anna, Ohio (AREA = 7.7 10↑3 sq km)

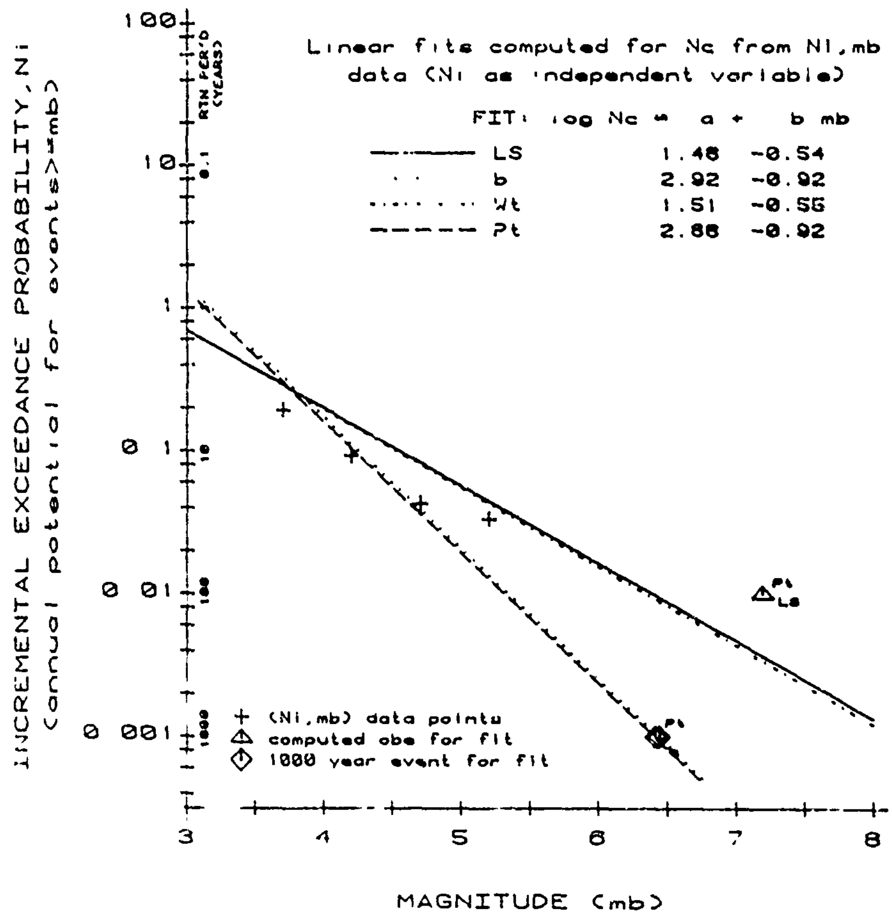
mb Range	Period of Calculation (years)	Number of Events	Occurrance Prob (per year)	Exceedence Prob, Ni (per year)	Exceedence Return Per'd (years)
> 5.9	160	0			
5.5-5.9	160	0			
5.0-5.4	120	4	0.033	0.033	30
4.5-4.9	100	1	0.010	0.043	23
4.0-4.4	80	4	0.050	0.093	11
3.5-3.9	50	5	0.100	0.193	5
3.0-3.4	0	0			

mb,Y data	Ni,X data	Period(years)	Weight
5.2	0.033	120	2
4.7	0.043	100	2
4.2	0.093	80	4
3.7	0.193	50	4

log Ni used as the independent variable; converted to Nc and resolved to the general form, log Nc on mb.

log Nc= a	+ b mb	r	s(e)	Nc(cal) (mb=3)	mb(cal) (Nc=E-3)	FIT
1.48	-0.54	_-0.98	0.03_	0.70	8.2	Least Squares
		mb=4.45; ts(mb)=0.22; ts(b)=0.74; obe=7.2(270yrs)				
2.88	-0.92	_-0.59	0.29_	1.34	6.4	Con'd to 6.4,.001
		mb=4.45; ts(mb)=0.52; ts(b)=1.73; obe=7.2(5230yrs)				
2.92	-0.92	-0.58	0.29	1.46	6.4	Con'd to b=-.92
		t(b)cal=1.49 < 2.92=t(10%)				
1.51	-0.55	-0.99	0.02	0.71	8.2	Wtd:1,4,4,2,2,1

Zone Anna, Ohio



SOTHERN ILLINOIS-WABASH

Zone: SIWB Date List

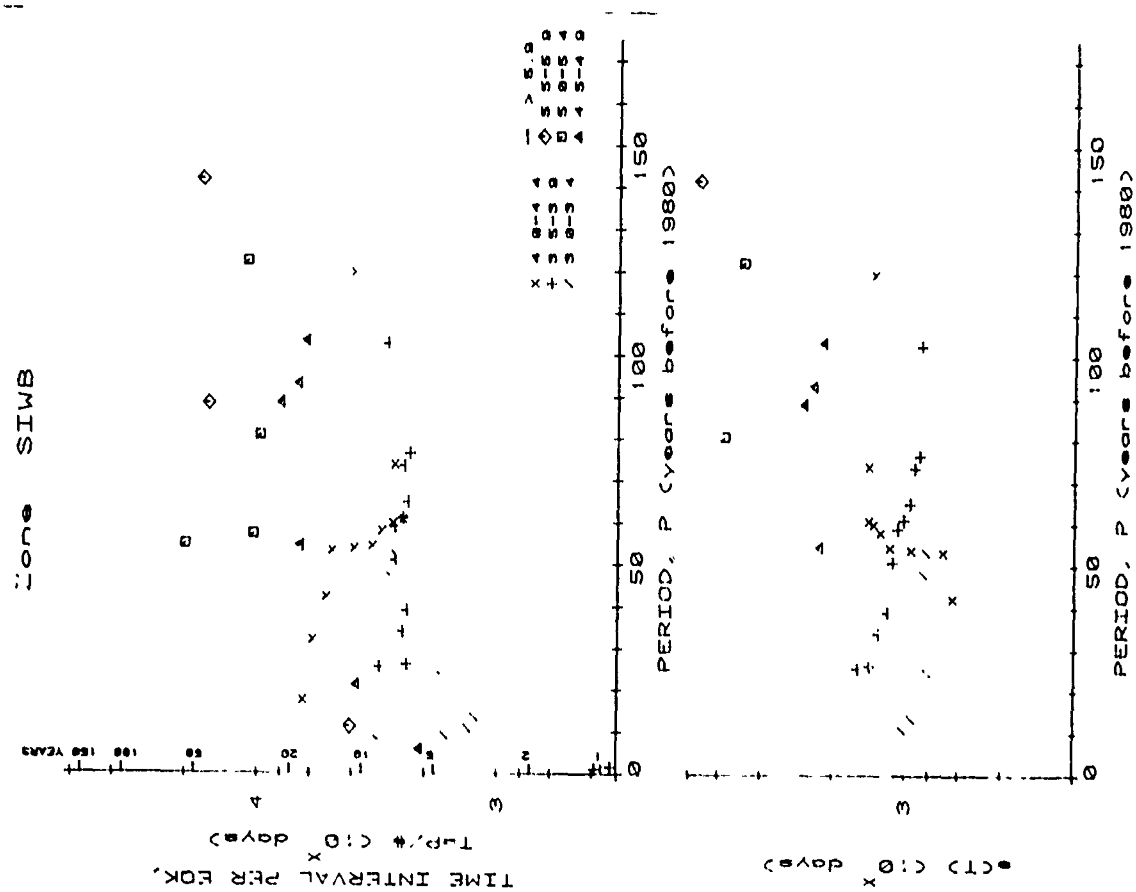
	Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#
	1978.12 4	2-	1		1978. 6 2	2-	2		1974. 4 3	4-	1		1971. 212	1-	1
	1970.12 8	1-	2		1969. 228	1-	3		1968.11 9	2-	3	*	1968.11 9	1-	4
*	1968.11 9	6-	1		1966. 622	1-	5		1962. 626	3-	1		1958.11 7	4-	2
	1955. 529	1-	6		1954. 8 9	2-	4		1953.1230	2-	5		1948. 1 5	3-	2
	1946. 224	2-	6		1940.1228	2-	7		1937.1117	3-	3		1931.1231	1-	7
	1929. 214	2-	8		1926.1026	3-	4		1926.10 3	1-	8		1926. 322	3-	5
	1925. 920	3-	6		1925. 9 2	4-	3		1925. 426	5-	1		1922.1126	5-	2
	1922. 110	3-	7		1921. 331	2-	9		1920. 430	3-	8		1919. 525	3-	9
	1919. 210	2-	10		1915. 415	2-	11		1906. 9 7	2-	12		1906. 521	3-	10
*	1906. 511	2-	13		1903. 921	2-	14		1899. 429	5-	3		1891. 926	6-	2
	1891. 726	4-	4		1887. 2 6	4-	5		1877. 526	2-	15		1876. 926	1-	9
*	1876. 925	4-	6	*	1876. 924	4-	7		1860. 8 7	3-	11		1857.10 8	5-	4
	1838. 6 9	6-	3												

Zone: SIWB Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
RANGE mb:		3.0-3.4									
1	9	9	3244		0.113	2	9	5	1655		0.221
3	11	4	1319	1028	0.277	4	14	3	1235	938	0.296
5	25	5	1796	813	0.203	6	48	8	2922	849	0.125
7	53	8	2778	825	0.131						
RANGE mb:		3.5-3.9									
1	1	1	392		0.932	2	2	1	289		1.266
3	25	8	3092	1589	0.118	4	26	7	2374	1413	0.154
5	34	7	2473	1293	0.148	6	39	7	2375	1187	0.154
7	51	7	2655	1127	0.138	8	59	7	2682	1075	0.136
9	61	7	2471	1016	0.148	10	65	6	2364	962	0.155
11	73	7	2434	917	0.150	12	76	6	2322	876	0.157
13	103	8	2883	862	0.127						
RANGE mb:		4.0-4.4									
1	18	18	6397		0.057	2	32	16	5842		0.063
3	42	14	5128	636	0.071	4	53	13	4856	698	0.075
5	54	11	3928	946	0.093	6	54	9	3304	1155	0.111
7	58	8	3025	1272	0.121	8	60	7	2724	1359	0.134
9	61	7	2459	1426	0.149	10	74	7	2689	1426	0.136
11	119	11	3964	1353	0.092						
RANGE mb:		4.5-4.9									
1	6	6	2098		0.174						

Zone: SIWB Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
2	21	11	3862		0.095						
3	54	18	6614	2276	0.055	4	88	22	8075	2688	0.045
5	93	19	6786	2438	0.054	6	103	17	6286	2205	0.058
RANGE mb:		5.0-5.4									
1	55	55	19972		0.018	2	57	29	10427		0.035
3	81	27	9822	5694	0.037	4	122	31	11161	4783	0.033
RANGE mb:		5.5-5.9									
1	11	11	4069		0.090	2	88	44	16119		0.023
3	142	47	17235	7300	0.021						



10 YEAR LISTING of Earthquakes by Magnitude

*** ZONE SIWB ***

YEAR / mb	<3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979		2	2		1			
1960-1969		2		1			1	
1950-1959		1	2		1			
1940-1949			2	1				
1930-1939		1		1				
1920-1929		1	2	5	1	2		
1910-1919			2	1				
1900-1909			2	1				
1890-1899					1	1	1	
1880-1889					1			
1870-1879			1		1			
1860-1869				1				
1850-1859						1		
1840-1849								
1830-1839							1	
1820-1829								
1810-1819								
1800-1809								
1790-1799								
SUMS	0	7	13	11	6	4	3	0

\# of events = 44
EARLY YEAR = 1838 RECENT YEAR = 1978
MIN mb = 3.0 MAX mb = 5.8

10 YEAR LISTING of Recurrence Rate, R (#/yr), by Magnitude

*** ZONE SIWB ***

YEAR / mb	<3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979		0.200	0.200		0.100			
1960-1979		0.200	0.100	0.050	0.050		0.050	
1950-1979		0.167	0.133	0.033	0.067		0.033	
1940-1979		0.125	0.150	0.050	0.050		0.025	
1930-1979		0.120	0.120	0.060	0.040		0.020	
1920-1979		0.117	0.133	0.133	0.050	0.033	0.017	
1910-1979		0.100	0.143	0.129	0.043	0.029	0.014	
1900-1979		0.088	0.150	0.125	0.038	0.025	0.013	
1890-1979		0.078	0.133	0.111	0.044	0.033	0.022	
1880-1979		0.070	0.120	0.100	0.050	0.030	0.020	
1870-1979		0.064	0.118	0.091	0.055	0.027	0.018	
1860-1979		0.058	0.108	0.092	0.050	0.025	0.017	
1850-1979		0.054	0.100	0.085	0.046	0.031	0.015	
1840-1979		0.050	0.093	0.079	0.043	0.029	0.014	
1830-1979		0.047	0.087	0.073	0.040	0.027	0.020	
1820-1979		0.044	0.081	0.069	0.038	0.025	0.019	
TOTAL #	0	7	13	11	6	4	3	0

10 YEAR LISTING of Earthquakes by max MM Intensity

*** ZONE SIWB ***

YEAR / Io	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1970-1979			1	2	1	1						
1960-1969			2		1		1					
1950-1959			1	2		1						
1940-1949			1	1	1							
1930-1939		1			1							
1920-1929			1	6	1	1	2					
1910-1919			1	1	1							
1900-1909				2	1							
1890-1899						1	2					
1880-1889						1						
1870-1879				1		1						
1860-1869					1							
1850-1859							1					
1840-1849												
1830-1839								1				
1820-1829												
1810-1819												
1800-1809												
1790-1799												
SUMS	0	1	7	15	8	6	6	1	0	0	0	0

# of events = 44
EARLY YEAR = 1838 RECENT YEAR = 1978
MIN Io = II MAX Io = VIII

ZONE: S IL / Wabash (AREA = 29.2 10↑3 sq km)

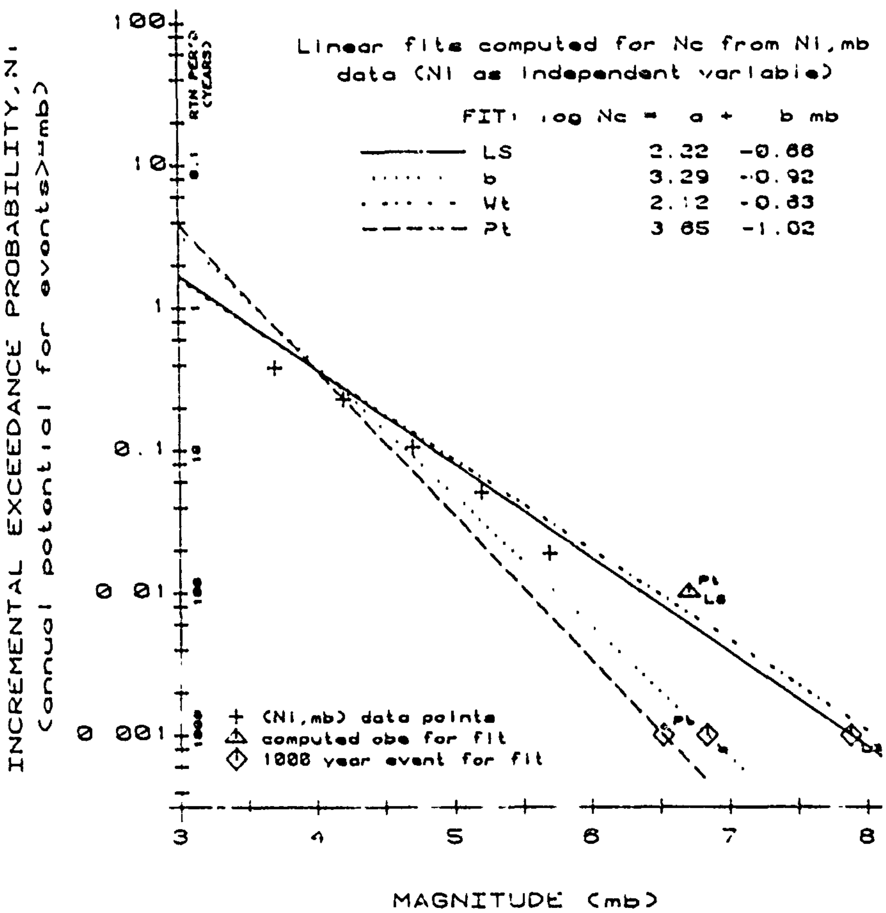
mb Range	Period of Calculation (years)	Number of Events	Occurrance Prob (per year)	Exceedence Prob, Ni (per year)	Exceedence Return Per'd (years)
> 5.9	160	0			
5.5-5.9	160	3	0.019	0.019	53
5.0-5.4	125	4	0.032	0.051	20
4.5-4.9	110	6	0.055	0.105	9
4.0-4.4	80	10	0.125	0.230	4
3.5-3.9	80	12	0.150	0.380	3
3.0-3.4	0	0			

mb,Y data	Ni,X data	Period(years)	Weight
5.7	0.019	160	1
5.2	0.051	125	2
4.7	0.105	110	2
4.2	0.230	80	4
3.7	0.380	80	4

log Ni used as the independent variable; converted to Nc and resolved to the general form, log Nc on mb.

log Nc= a	+ b mb	r	s(e)	Nc(cal) (mb=3)	mb(cal) (Nc=E-3)	FIT
2.22	-0.66	-0.99	0.01	1.71	7.9	Least Squares
mb=4.70; ts(mb)=0.11; ts(b)=0.23; obe=6.7(160yrs)						
3.65	-1.02	-0.65	0.26	3.91	6.5	Con'd to 6.5,.001
mb=4.70; ts(mb)=0.36; ts(b)=0.78; obe=6.7(1560yrs)						
3.29	-0.92	-0.72	0.19	3.37	6.8	Con'd to b=-.92
t(b)cal=2.69 < 3.18=t(5%)						
2.12	-0.63	-0.99	0.01	1.63	8.1	Wtd:1,4,4,2,2,1

Zone S IL / Wabash



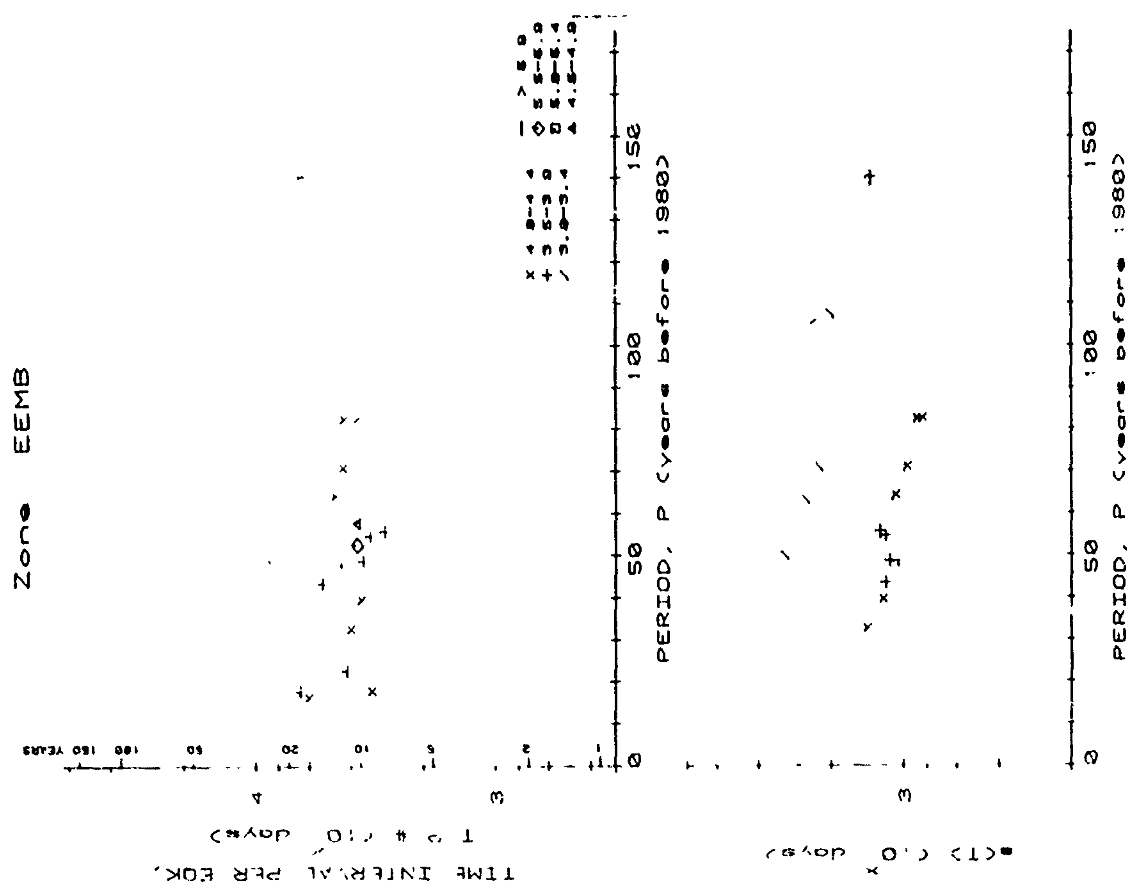
EAST EMBAYMENT

Zone: EEMB Date List

	Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#
0	1979. 217	0-	00		1972. 618	1-	1		1963. 8 2	3-	1		1962. 216	2-	1
*	1962. 2 2	3-	2		1957. 326	2-	2		1947. 326	3-	3		1940. 531	3-	4
	1936. 8 2	2-	3		1931. 4 6	2-	4	*	1931. 4 1	2-	5		1930. 9 3	1-	2
*	1930. 9 3	1-	3		1930. 1 2	1-	4		1927. 5 7	6-	1		1925. 513	2-	6
	1924. 4 2	2-	7		1922. 323	3-	5	*	1922. 322	3-	6	*	1922. 322	4-	1
	1916.1019	1-	5		1915.1026	3-	7		1908.1231	1-	6	*	1908.1227	3-	8
	1897. 430	3-	9	*	1897. 425	3-	10		1872. 326	1-	7		1839. 9 5	2-	8

Zone: EEMB Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
RANGE mb:		3.0-3.4									
1	8	8	2752		0.133	2	49	25	9008		0.041
3	50	17	6087	3130	0.060	4	63	16	5771	2557	0.063
5	71	14	5186	2238	0.070	6	108	18	6560	2028	0.056
RANGE mb:		3.5-3.9									
1	18	18	6527		0.056	2	23	11	4158		0.088
3	43	14	5285	1185	0.069	4	49	12	4450	1062	0.082
5	49	10	3561	1150	0.103	6	55	9	3326	1191	0.110
7	56	8	2909	1252	0.126	8	140	18	6406	1374	0.057
RANGE mb:		4.0-4.4									
1	16	16	5995		0.061	2	18	9	3271		0.112
3	33	11	3989	1412	0.092	4	40	10	3615	1221	0.101
5	64	13	4688	1078	0.078	6	71	12	4323	964	0.084
7	83	12	4313	880	0.085	8	83	10	3775	837	0.097
RANGE mb:		4.5-4.9									
1	58	10	3775		0.097						
RANGE mb:		5.5-5.9									
1	53	10	3775		0.097						



10 YEAR LISTING of Earthquakes by Magnitude

*** ZONE EEMB ***

YEAR \ mb	<3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979		1						
1960-1969			1	2				
1950-1959			1					
1940-1949				2				
1930-1939		2	3					
1920-1929			2		1		1	
1910-1919		1		1				
1900-1909		1		1				
1890-1899				2				
1880-1889								
1870-1879		1						
1860-1869								
1850-1859								
1840-1849								
1830-1839			1					
1820-1829								
1810-1819								
1800-1809								
1790-1799								
SUMS	0	6	8	8	1	0	1	0

# of events = 24
EARLY YEAR = 1839 RECENT YEAR = 1972
MIN mb = 3.0 MAX mb = 5.7

10 YEAR LISTING of Recurrence Rate, R (#/yr), by Magnitude

*** ZONE EEMB ***

YEAR \ mb	<3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979		0.100						
1960-1979		0.050	0.050	0.100				
1950-1979		0.033	0.067	0.067				
1940-1979		0.025	0.050	0.100				
1930-1979		0.060	0.100	0.080				
1920-1979		0.050	0.117	0.067	0.017		0.017	
1910-1979		0.057	0.100	0.071	0.014		0.014	
1900-1979		0.063	0.088	0.075	0.013		0.013	
1890-1979		0.056	0.078	0.089	0.011		0.011	
1880-1979		0.050	0.070	0.080	0.010		0.010	
1870-1979		0.055	0.064	0.073	0.009		0.009	
1860-1979		0.050	0.058	0.067	0.008		0.008	
1850-1979		0.046	0.054	0.062	0.008		0.008	
1840-1979		0.043	0.050	0.057	0.007		0.007	
1830-1979		0.040	0.053	0.053	0.007		0.007	
1820-1979		0.038	0.050	0.050	0.006		0.006	
TOTAL #	0	6	8	8	1	0	1	0

10 YEAR LISTING of Earthquakes by max MM Intensity

*** ZONE EEMB ***

YEAR \ Io	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1970-1979			1									
1960-1969				1	1	1						
1950-1959				1								
1940-1949				1	1							
1930-1939		1	3	1								
1920-1929				1	2		1					
1910-1919			1		1							
1900-1909			1	1								
1890-1899					2							
1880-1889												
1870-1879			1									
1860-1869												
1850-1859												
1840-1849												
1830-1839				1								
1820-1829												
1810-1819												
1800-1809												
1790-1799												
SUMS	0	1	7	7	7	1	1	0	0	0	0	0

# of events = 24
EARLY YEAR = 1839 RECENT YEAR = 1972
MIN Io = II MAX Io = VII

ZONE: East Embayment (AREA = 11.6 10↑3 sq km)

mb Range	Period of Calculation (years)	Number of Events	Occurrance Prob (per year)	Exceedence Prob, Ni (per year)	Exceedence Return Per'd (years)
> 5.9	160	0			
5.5-5.9	160	1	0.006	0.006	160
5.0-5.4	120	0	0.000	0.006	160
4.5-4.9	100	1	0.010	0.016	62
4.0-4.4	85	8	0.094	0.110	9
3.5-3.9	60	7	0.117	0.227	4
3.0-3.4	0	0			

Mb,Y data	Ni,X data	Period(years)	Weight
5.7	0.006	160	1
5.2	0.006	120	2
4.7	0.016	100	2
4.2	0.110	85	4
3.7	0.227	60	4

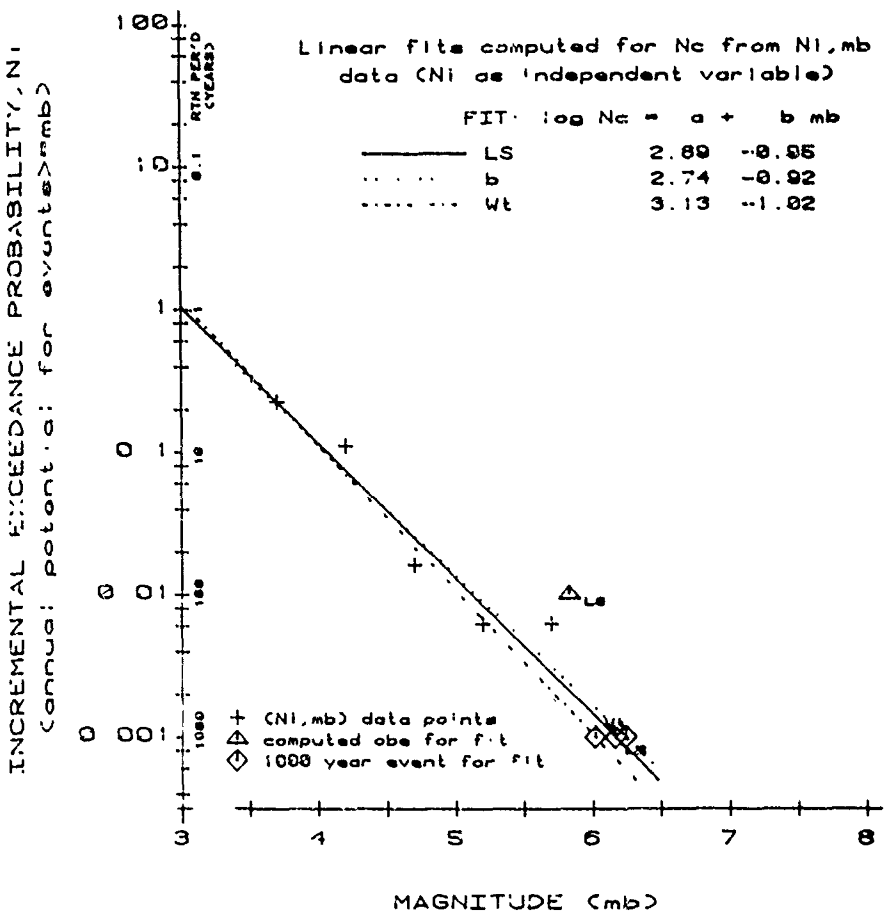
log Ni used as the independent variable; converted to Nc and resolved to the general form, log Nc on mb.

log Nc = a + b mb		r	s(e)	Nc(cal) (mb=3)	mb(cal) (Nc=E-3)	FIT
2.89	-0.95	-0.96	0.08	1.05	6.2	Least Squares
2.74	-0.92	-0.99	0.03	0.95	6.2	Con'd to b=-.92
3.13	-1.02	-0.97	0.04	1.18	6.0	Wtd:1,4,4,2,2,1

(Least Squares:) mb=4.70; ts(mb)=0.28; ts(b)=0.13; obe=5.8(470yrs)

(Con'd to b=-.92:) t(b)cal=0.19 < 2.35=t(10%)

Zone East Embayment



NEW MADRID

Zone: NMAD　　　　Date List

	Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#
0	1979.1126	0-	00	0	1979. 713	0-	00		1979. 7 8	1-	1	*	1979. 625	1-	2
	1979. 610	2-	1		1979. 2 4	1-	3	0	1979. 2 2	0-	00	0	1978.12 6	0-	00
0	1978. 910	0-	00	0	1978. 9 7	0-	00		1978. 830	2-	2	0	1978. 720	0-	00
0	1978. 4 5	0-	00	0	1978. 330	0-	00	0	1978. 110	0-	00	0	1977.11 9	0-	00
	1977.10 4	1-	4	0	1977. 328	0-	00		1976. 925	2-	3		1976. 522	1-	5
	1976. 324	5-	1	*	1976. 324	4-	1	0	1976. 122	0-	00	0	1975.12 2	0-	00
0	1975. 925	0-	00		1975. 825	1-	6	0	1975. 820	0-	00	0	1975. 7 6	6-	00
	1975. 620	1-	7	*	1975. 613	3-	1		1975. 213	1-	8		1975. 1 2	1-	9
0	1974.1225	0-	00	0	1974.11 7	0-	00	0	1974.10 1	0-	00		1974. 513	3-	2
	1974. 312	1-	10	0	1974. 310	0-	00	*	1974. 3 4	1-	11	*	1974. 224	1-	12
	1974. 1 7	3-	3		1973.1220	1-	13		1973.10 9	2-	4	*	1973.10 2	1-	14
	1972. 5 6	1-	15		1972. 329	2-	5		1971.1018	1-	16		1971.10 1	3-	4
	1971. 413	1-	17		1970.1224	2-	6	*	1970.1214	1-	18		1970.1129	1-	19
*	1970.1116	3-	5	*	1970.11 5	1-	20		1970. 326	1-	21		1970. 1 7	2-	7
	1969. 727	1-	22		1968. 714	1-	23		1968. 529	2-	8		1968. 2 9	2-	9
	1968. 123	1-	24		1967.1017	1-	25		1967. 7 6	1-	26		1967. 411	1-	27
	1967. 212	1-	28		1966. 313	1-	29		1966. 213	2-	10	*	1966. 211	2-	11
	1965.1219	2-	12		1965. 814	2-	13	*	1965. 813	1-	30		1965. 7 8	1-	31
	1965. 6 1	1-	32	*	1965. 525	1-	33		1965. 326	1-	34	*	1965. 325	2-	14
	1965. 210	1-	35		1964. 523	2-	15		1964. 316	2-	16		1964. 125	1-	36
*	1964. 115	1-	37		1963. 5 1	1-	38		1963. 4 6	1-	39	*	1963. 331	1-	40
	1962. 723	3-	6		1962. 6 1	1-	41	*	1962. 524	1-	42		1962. 325	1-	43
	1960. 421	3-	7		1960. 128	3-	8		1959.1221	3-	9		1959. 720	1-	44
	1959. 213	3-	10		1959. 121	2-	17		1958. 519	2-	18		1958. 426	3-	11
	1958. 4 8	3-	12		1958. 127	3-	13	*	1958. 126	3-	14		1957. 817	2-	19
	1956.1029	3-	15		1956. 128	4-	2	*	1956. 123	1-	45		1955.1213	3-	16
*	1955.1213	1-	46		1955. 924	2-	20		1955. 9 6	1-	47	*	1955. 9 5	3-	17
	1955. 329	4-	3		1955. 125	4-	4		1954. 426	3-	18		1954. 117	2-	21
	1953. 515	1-	48	*	1953. 512	2-	22	*	1953. 5 6	1-	49		1953. 218	1-	50

Zone: NMAD　　　　Date List

	Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#
*	1953. 217	2-	23	*	1953. 217	1-	51	*	1953. 211	2-	24		1952.1228	1-	52
*	1952.1225	1-	53	*	1952.1224	3-	19	*	1952.1224	2-	25		1952.1016	2-	26
*	1952.1016	1-	54	*	1952.1016	1-	55	*	1952.1016	1-	56		1952. 716	4-	5
*	1952. 716	2-	27		1952. 528	2-	28		1952. 220	3-	20		1951.1218	1-	57
*	1951.1217	1-	58		1950. 5 1	1-	59		1949. 813	1-	60		1949. 131	3-	21
	1949. 113	3-	22		1947.1215	3-	23		1947. 116	1-	61		1945.1113	3-	24
	1945.1027	1-	62		1945. 923	2-	29		1945. 8 6	1-	63	*	1945. 8 6	1-	64
	1945. 5 2	2-	30		1944.1223	2-	31		1942. 831	2-	32		1941.1116	4-	6
*	1941.1114	2-	33		1941.1026	1-	65	*	1941.1021	2-	34	*	1941.10 8	3-	25
	1941. 827	1-	66		1940.1010	1-	67		1940. 919	1-	68		1940. 214	1-	69
	1939. 919	1-	70		1939. 415	1-	71		1938. 928	1-	72	*	1938. 918	1-	73
*	1938. 910	1-	74	*	1938. 917	1-	75	*	1938. 917	4-	7		1938. 617	1-	76
	1938. 316	1-	77		1937.10 5	1-	78		1937. 623	1-	79		1937. 130	2-	35
	1936.1031	1-	80	*	1936.1020	1-	81		1936. 216	2-	36		1935. 723	2-	37
	1934. 819	4-	8	*	1934. 819	1-	82		1934. 7 2	2-	38		1933.12 9	3-	26
	1931.1210	2-	39		1931.1122	2-	40		1931. 718	2-	41		1930. 9 1	3-	27
*	1930. 829	3-	28		1930. 813	1-	83		1930. 4 2	2-	42	*	1930. 327	2-	43
	1930. 210	1-	84		1929. 512	2-	44		1928. 531	2-	45		1928. 423	2-	46
*	1928. 415	2-	47		1927. 813	3-	29		1927. 5 7	5-	2		1927. 418	3-	30
	1926.1217	3-	31	*	1926.1213	2-	48		1926. 427	3-	32		1924. 6 6	3-	33
	1923.1231	4-	9		1923.1129	2-	49	*	1923.1126	3-	34		1923.1028	5-	3
	1923. 515	2-	50	*	1923. 5 6	2-	51		1922. 330	3-	35		1921. 227	2-	52
	1921. 1 9	2-	53		1919. 528	2-	54	*	1919. 528	2-	55	*	1919. 526	2-	56
*	1919. 524	2-	57	*	1919. 523	2-	58		1918.10 4	3-	36		1918. 217	2-	59
	1916.1210	4-	10		1916. 824	2-	60		1916. 521	3-	37		1915.12 7	4-	11
	1915.11 8	2-	61		1915. 428	3-	38		1908.1027	3-	39		1908. 928	3-	40
	1905. 821	5-	4		1903.1127	3-	41	*	1903.1127	3-	42	*	1903.1125	1-	85
*	1903.1124	1-	86		1903.11 4	5-	5	*	1903.11 4	4-	12		1901. 914	1-	87
	1901. 214	3-	43		1898. 614	4-	13		1898. 126	2-	62		1895.1117	2-	63

Zone: NMAD Date List

```
  Year.MoDa M- #    Year.MoDa M- #    Year.MoDa M- #    Year.MoDa M- #
  1895.11 2 2- 64 * 1895.11 2 2- 65 * 1895.11 1 2- 66 * 1895.1031 7-  1
* 1895.1018 1- 88 * 1895.1017 1- 89 * 1895.10 3 1- 90   1892. 114 1- 91
  1891. 114 2- 67   1889. 719 2- 68   1889. 6 5 1- 92   1888.11 3 2- 69
  1887. 8 2 4- 14   1886. 318 2- 70 * 1886. 317 4- 15   1884.1129 3- 44
  1883. 714 3- 45 * 1883. 7 6 1- 93   1883. 611 4- 16   1883. 412 3- 46
  1883. 111 4- 17   1882. 720 3- 47   1881.10 7 2- 71   1880. 713 3- 48
  1879. 925 2- 72   1879. 726 1- 94   1878.1118 4- 18   1878. 312 3- 49
  1878. 1 8 2- 73   1877.1119 2- 74   1875.1027 2- 75   1875.10 7 3- 50
  1874. 7 9 2- 76   1873. 822 1- 95   1873. 5 3 3- 51   1872. 820 1- 96
  1872. 420 1- 97   1872. 2 8 2- 77   1870.1214 2- 78   1868.1121 1- 98
  1865. 9 7 2- 79   1865. 817 5-  6   1858. 921 4- 19   1857. 2 0 2- 80
  1856.11 9 3- 52   1855. 5 3 1- 99 * 1855. 5 2 2- 81   1853.1218 4- 20
* 1853.1212 4- 21   1853. 828 1-100   1849. 124 3- 53   1846. 323 1-101
  1843. 613 1-102   1843. 216 4- 22   1843. 1 4 7-  2   1842.11 4 3- 54
* 1842.11 4 3- 55   1842. 527 2- 82   1842. 327 2- 83   1841.1227 3- 56
  1820. 027 2- 84   1818. 3 0 1-103   1816. 725 2- 85 * 1816. 725 2- 86
  1812. 2 7 7-  3   1812. 123 7-  4   1811.1216 7-  5   1699.1225 3- 57
```

Do you wish to plot Time Intrl-Period Curves (Y or N)?

Zone: NMAD Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
RANGE mb:		3.0-3.4									
1	0	0	176		2.075	2	1	0	95		3.865
3	1	0	110	43	3.320	4	2	1	205	53	1.786
5	4	1	264	69	1.386	6	4	1	265	73	1.379
7	5	1	255	72	1.435	8	5	1	228	67	1.602
9	6	1	236	64	1.551	10	6	1	214	61	1.710
11	6	1	200	58	1.825	12	6	1	190	55	1.922
13	8	1	215	53	1.699	14	8	1	214	51	1.707
15	9	1	212	49	1.721	16	9	1	207	47	1.769
17	9	1	195	46	1.871	18	10	1	198	45	1.843
19	10	1	200	43	1.822	20	11	1	209	42	1.745
21	12	1	208	41	1.759	22	12	1	203	40	1.802
23	12	1	198	39	1.842	24	13	1	194	38	1.886
25	13	1	188	38	1.941	26	14	1	194	37	1.884
27	14	1	196	36	1.865	28	15	1	190	36	1.920
29	15	1	184	35	1.986	30	15	0	181	35	2.015
31	16	1	188	34	1.942	32	17	1	190	34	1.920
33	17	1	185	33	1.972	34	18	1	189	33	1.934
35	18	1	184	33	1.988	36	18	0	180	32	2.026
37	20	1	202	32	1.809	38	24	1	230	32	1.587
39	27	1	250	32	1.463	40	27	1	247	33	1.481
41	28	1	250	33	1.462	42	30	1	258	34	1.416
43	30	1	258	34	1.415	44	33	1	274	36	1.335

Zone: NMAD Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
45	34	1	277	37	1.317	46	34	1	273	38	1.337
47	38	1	297	39	1.231	48	38	1	292	40	1.252
49	39	1	292	42	1.249	50	39	1	287	42	1.273
51	40	1	286	43	1.279	52	40	1	283	44	1.291
53	41	1	281	44	1.302	54	41	1	279	44	1.309
55	42	1	276	45	1.324	56	42	1	273	45	1.340
57	42	1	271	45	1.350	58	43	1	268	45	1.364
59	43	1	267	45	1.366	60	49	1	301	45	1.215
61	50	1	299	46	1.223	62	78	1	461	54	0.792
63	84	1	488	63	0.748	64	84	1	481	69	0.760
65	88	1	494	76	0.739	66	91	1	501	82	0.729
67	100	1	547	89	0.667	68	106	2	571	96	0.639
69	107	2	568	103	0.643	70	108	2	562	108	0.650
71	111	2	572	113	0.639	72	126	2	641	121	0.570
73	134	2	669	128	0.546	74	137	2	674	136	0.542
75	162	2	788	147	0.463						
RANGE mb:		3.5-3.9									
1	1	1	204		1.790	2	1	1	244		1.497
3	3	1	397	102	0.919	4	6	2	569	166	0.642
5	8	2	567	172	0.645	6	9	2	549	166	0.665
7	10	1	521	156	0.701	8	12	1	529	149	0.690
9	12	1	483	139	0.757	10	14	1	507	133	0.721
11	14	1	461	126	0.792	12	14	1	427	120	0.855
13	14	1	404	116	0.904	14	15	1	385	113	0.948
15	16	1	380	110	0.961	16	16	1	361	108	1.013
17	21	1	450	105	0.812	18	22	1	439	102	0.833
19	22	1	430	99	0.849						

Zone: NMAD Recurrence List

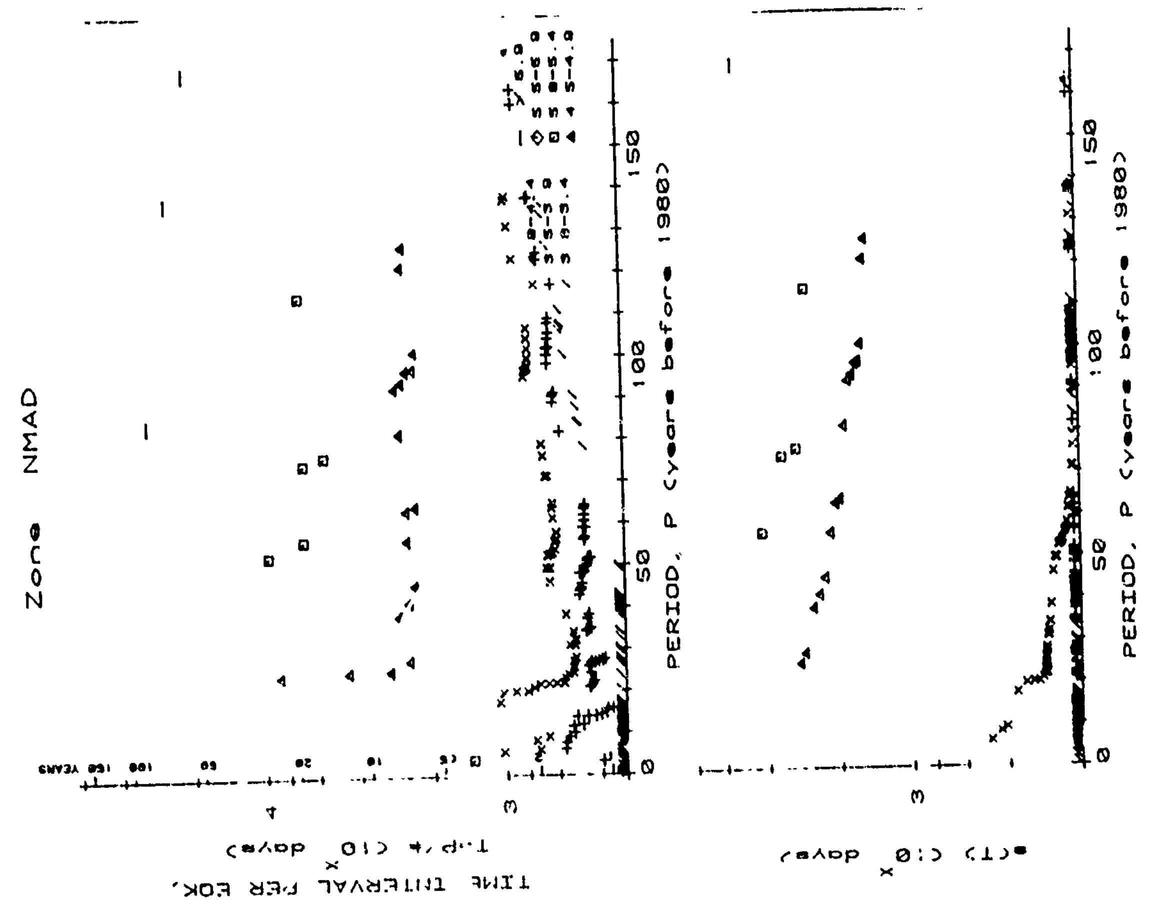
#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
20	24	1	443	96	0.824						
21	26	1	451	94	0.809	22	27	1	442	92	0.826
23	27	1	427	90	0.856	24	27	1	411	88	0.888
25	27	1	397	86	0.919	26	28	1	388	85	0.942
27	34	1	464	84	0.788	28	35	1	452	82	0.808
29	35	1	441	81	0.828	30	37	1	455	79	0.804
31	38	1	450	78	0.812	32	43	1	490	77	0.746
33	44	1	486	77	0.752	34	44	1	477	76	0.765
35	45	1	475	75	0.769	36	48	1	488	74	0.749
37	48	1	475	73	0.769	38	48	1	466	72	0.784
39	50	1	466	71	0.784	40	50	1	454	71	0.804
41	51	1	451	70	0.810	42	52	1	449	69	0.814
43	52	1	439	68	0.832	44	56	1	466	67	0.784
45	57	1	460	67	0.794	46	59	1	467	66	0.792
47	59	1	458	65	0.797	48	61	1	461	64	0.792
49	62	1	461	64	0.792	50	63	1	463	63	0.789
51	64	1	459	63	0.795	52	82	2	575	64	0.635
53	89	2	613	68	0.596	54	90	2	612	70	0.597
55	91	2	605	73	0.603	56	98	2	641	76	0.570
57	100	2	642	79	0.569	58	102	2	642	82	0.569
59	102	2	632	84	0.578	60	104	2	634	86	0.576
61	105	2	632	87	0.578	62	108	2	636	89	0.575
63	109	2	632	90	0.578	64	123	2	701	94	0.521
65	125	2	701	97	0.521	66	138	2	761	102	0.480
67	138	2	751	106	0.486	68	160	2	859	114	0.425
69	163	2	865	121	0.422						

Zone: NMAD Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
RANGE mb:		4.0-4.4									
1	5	5	1662		0.220	2	6	3	1029		0.355
3	6	2	728	477	0.502	4	8	2	753	435	0.485
5	9	2	666	412	0.548	6	17	3	1062	371	0.344
7	20	3	1028	339	0.355	8	20	2	910	315	0.402
9	20	2	813	300	0.445	10	21	2	763	290	0.479
11	22	2	720	283	0.507	12	22	2	661	280	0.552
13	22	2	616	279	0.593	14	22	2	572	280	0.638
15	23	2	564	281	0.647	16	24	2	549	280	0.665
17	24	1	523	281	0.699	18	26	1	521	280	0.701
19	27	1	519	279	0.703	20	28	1	509	278	0.718
21	31	1	538	275	0.679	22	31	1	514	273	0.711
23	32	1	509	271	0.718	24	34	1	519	268	0.703
25	38	2	559	265	0.654	26	46	2	647	260	0.564
27	49	2	667	255	0.547	28	49	2	644	250	0.568
29	52	2	660	246	0.554	30	53	2	642	242	0.569
31	53	2	625	238	0.584	32	54	2	613	235	0.596
33	56	2	615	232	0.594	34	56	2	603	229	0.606
35	58	2	603	226	0.606	36	61	2	621	223	0.588
37	64	2	628	220	0.582	38	65	2	622	217	0.588
39	71	2	667	214	0.548	40	71	2	651	212	0.561
41	76	2	678	209	0.539	42	79	2	686	206	0.532
43	95	2	808	205	0.452	44	96	2	801	203	0.456
45	97	2	785	201	0.465	46	97	2	774	200	0.472
47	99	2	773	198	0.473	48	102	2	775	196	0.472
49	104	2	777	194	0.470	50	107	2	779	193	0.469

Zone: NMAD Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
51	123	2	882	192	0.414	52	131	3	920	193	0.397
53	137	3	945	194	0.386	54	138	3	933	194	0.391
55	280	5	1860	247	0.196						
RANGE mb:		4.5-4.9									
1	24	24	8738		0.042	2	25	12	4522		0.081
3	25	8	3035	2959	0.120	4	27	7	2507	2824	0.146
5	38	8	2785	259[illegible]	0.131	6	41	7	2513	2432	0.145
7	45	6	2367	2306	0.154	8	56	7	2557	2178	0.143
9	63	7	2558	2068	0.143	10	64	6	2340	1985	0.156
11	82	7	2708	1694	0.135	12	92	8	2813	1812	0.130
13	94	7	2635	1745	0.139	14	97	7	2519	1687	0.145
15	97	6	2361	1640	0.155	16	101	6	2308	1597	0.158
17	121	7	2606	1551	0.140	18	126	7	2558	1509	0.143
RANGE mb:		5.0-5.4									
1	4	4	1377		0.265	2	53	26	9616		0.038
3	56	19	6839	4192	0.053	4	74	19	6790	3448	0.054
5	76	15	5563	2998	0.066	6	114	19	6962	2708	0.052
RANGE mb:		> 5.9									
1	84	84	30741		0.012	2	137	68	25017		0.015
3	168	56	20441	5161	0.018						



10 YEAR LISTING of Earthquakes by Magnitude

*** ZONE NMAD ***

mb / YEAR	<3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979		18	7	5		1		
1960-1969		18	9	3				
1950-1959		6	10	12	4			
1940-1949		9	5	5	1			
1930-1939		10	9	3	2			
1920-1929			7	7	1	2		
1910-1919			4	3	2			
1900-1909		1		4		2		
1890-1899		3	2		1			1
1880-1889		1	3	5	4			
1870-1879		4	7	3	1			
1860-1869		1				1		
1850-1859		1	2	1	2			
1840-1849		2	2	3				1
1830-1839								
1820-1829			1					
1810-1819		1	1					1
1800-1809								
1790-1799								
SUMS	0	75	69	54	18	6	0	3

# of events = 225
EARLY YEAR = 1699
MIN mb = 3.0

RECENT YEAR = 1979
MAX mb = 7.4

10 YEAR LISTING of Recurrence Rate, R (#/yr), by Magnitude

*** ZONE NMAD ***

YEAR	mb <3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979		1.800	0.700	0.500		0.100		
1960-1979		1.800	0.800	0.400		0.050		
1950-1979		1.400	0.867	0.667	0.133	0.033		
1940-1979		1.275	0.775	0.625	0.125	0.025		
1930-1979		1.220	0.800	0.560	0.140	0.020		
1920-1979		1.017	0.783	0.583	0.133	0.050		
1910-1979		0.871	0.729	0.543	0.143	0.043		
1900-1979		0.775	0.638	0.525	0.125	0.063		
1890-1979		0.722	0.589	6.467	0.122	0.056		0.011
1880-1979		0.660	0.560	0.470	0.150	0.050		0.010
1870-1979		0.636	0.573	0.455	0.145	0.045		0.009
1860-1979		0.592	0.525	0.417	0.133	0.050		0.008
1850-1979		0.554	0.500	0.392	0.138	0.046		0.008
1840-1979		0.529	0.479	0.386	0.129	0.043		0.014
1830-1979		0.493	0.447	0.360	0.120	0.040		0.013
1820-1979		0.463	0.425	0.338	0.113	0.038		0.013
TOTAL #	0	74	68	54	18	6	0	2

10 YEAR LISTING of Earthquakes by max MM Intensity

*** ZONE NMAD ***

YEAR	Io I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1970-1979			10	8	9	4						
1960-1969			19	6	3	1	1					
1950-1959			6	12	10	4						
1940-1949			9	6	4	1						
1930-1939		3	8	9	2	2						
1920-1929			2	9	4		2					
1910-1919			2	3	2	2						
1900-1909			1	2	2		2					
1890-1899			3	3					1			
1880-1889			1	5	3	4						
1870-1879			5	8	1	1						
1860-1869			1				1					
1850-1859			1	3	1	1						
1840-1849			2	2	3			1				
1830-1839												
1820-1829				1								
1810-1819			1	1								1
1800-1809												
1790-1799												
SUMS	0	3	71	78	44	20	6	1	1	0	0	1

# of events = 225
EARLY YEAR = 1699 RECENT YEAR = 1979
MIN Io = II MAX Io = XII

ZONE: NMAD (AREA = 18.8 10↑3 sq km)

mb Range	Period of Calculation (years)	Number of Events	Occurrance Prob (per year)	Exceedence Prob, Ni (per year)	Exceedence Return Per'd (years)
> 5.9	160	2	0.000	0.013	80
5.5-5.9	160	0	0.000	0.013	80
5.0-5.4	160	6	0.038	0.050	20
4.5-4.9	130	18	0.138	0.188	5
4.0-4.4	110	50	0.455	0.643	2
3.5-3.9	80	51	0.638	1.281	1
3.0-3.4	20	36	1.800	3.081	0

mb,Y data	Ni,X data	Period(years)	Weight
5.7	0.013	160	1
5.2	0.050	160	2
4.7	0.188	130	2
4.2	0.643	110	4
3.7	1.281	80	4
3.2	3.081	20	1

log Ni used as the independent variable; converted to Nc and resolved to the general form, log Nc on mb.

log Nc= a	+ b mb	r	s(e)	Nc(cal) (mb=3)	mb(cal) (Nc=E-3)	FIT
3.68	-0.97	-0.99	0.02	5.91	6.9	Least Squares

mb=4.45; ts(mb)=0.11; ts(b)=0.14; obe=6.2(220yrs)

log Nc= a	+ b mb	r	s(e)	Nc(cal) (mb=3)	mb(cal) (Nc=E-3)	FIT
3.11	-0.82			4.64	7.5	Con'd to 7.5,.001

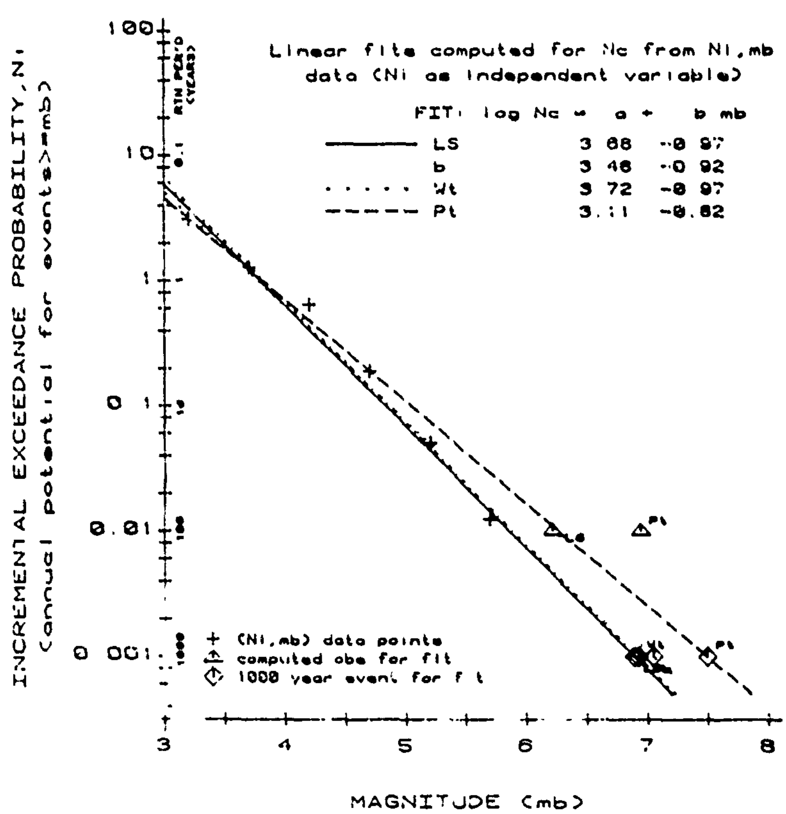
mb=4.45; ts(mb)=0.21; ts(b)=0.26; obe=6.9(350yrs)

log Nc= a	+ b mb	r	s(e)	Nc(cal) (mb=3)	mb(cal) (Nc=E-3)	FIT
3.48	-0.92			5.27	7.0	Con'd to b=-.92

t(b)cal=0.77 < 2.13=t(10%)

log Nc= a	+ b mb	r	s(e)	Nc(cal) (mb=3)	mb(cal) (Nc=E-3)	FIT
3.72	-0.97	-0.99	0.02	6.41	6.9	Wtd:1,4,4,2,2,1

Zone NMAD



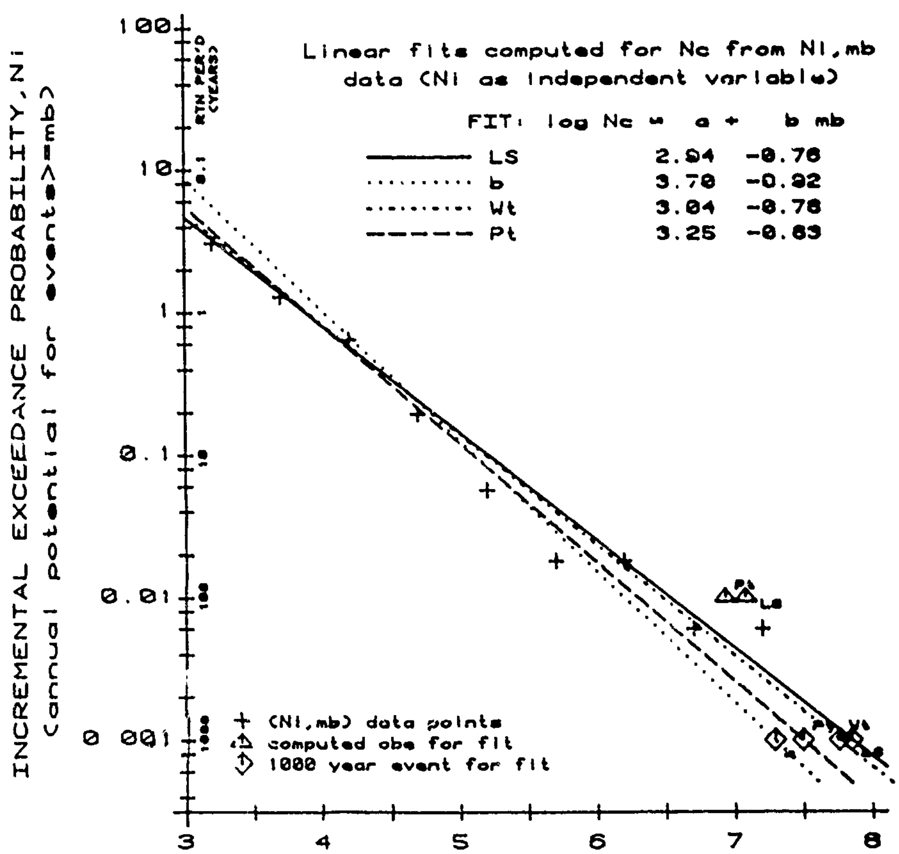
ZONE: N Madrid w 1812 (AREA = 18.8 10↑3 sq km)

mb,Y data	Ni,X data	Period(years)	Weight
7.2	0.006	170	1
6.7	0.006	160	1
6.2	0.018	160	1
5.7	0.018	160	1
5.2	0.056	160	2
4.7	0.192	125	2
4.2	0.649	110	4
3.7	1.287	80	4
3.2	3.087	20	1

log Ni used as the independent variable; converted to Nc and resolved to the general form, log Nc on mb.

log Nc= a	+ b mb	r	s(e)	Nc(cal) (mb=3)	mb(cal) (Nc=E-3)	FIT
2.94	-0.76	_-0.98	0.05_	4.69	7.8	Least Squares
mb=5.20; ts(mb)=0.17; ts(b)=0.17; obe=7.1(260yrs)						
3.25	-0.83	_-0.89	0.14_	5.63	7.5	Con'd to 7.5,.001
mb=5.20; ts(mb)=0.19; ts(b)=0.20; obe=6.9(330yrs)						
3.70	-0.92	-0.81	0.21	8.80	7.3	Con'd to b=-.92
t(b)cal=1.79 < 1.90=t(10%)						
3.04	-0.78	-0.99	0.03	5.08	7.8	Wtd:1,4,4,2,2,1

Zone: N Madrid w 1812



WEST EMBAMENT

Zone: WEMB   Date List

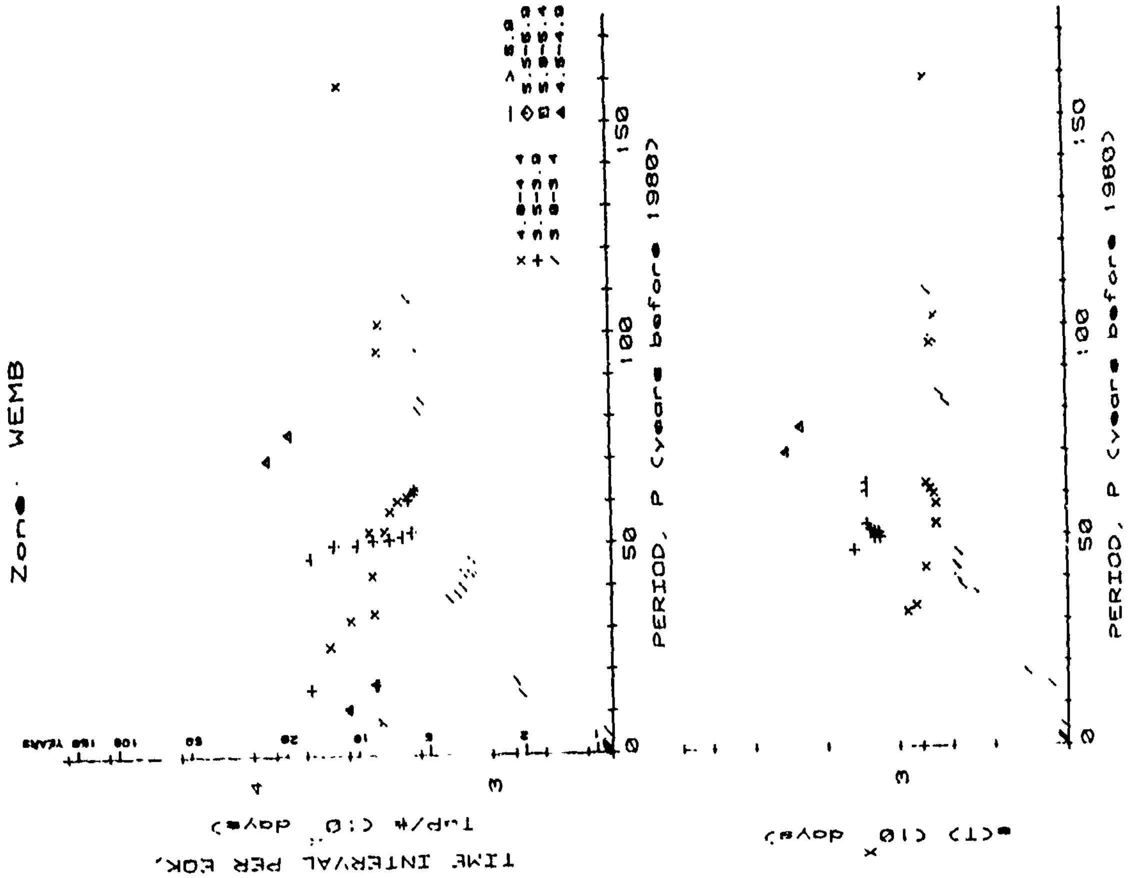
	Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#
	1979.11 5	1-	1		1979. 227	1-	2		1978. 923	1-	3		1978. 4 3	1-	4
	1977.1126	1-	5	0	1977. 415	0-	00		1974.1212	1-	6		1972. 131	3-	1
	1969. 1 1	4-	1		1965. 815	1-	7	*	1965. 814	1-	8	*	1965. 813	1-	9
	1964. 523	2-	1		1963. 419	2-	2		1963. 3 3	4-	2		1962. 713	1-	10
	1954. 2 2	3-	2		1947.12 1	3-	3		1946. 515	3-	4		1942.1130	1-	11
	1941.1122	1-	12		1940. 2 4	1-	13		1937. 516	3-	5		1936.1220	1-	14
	1936.1125	1-	15	*	1936.1123	1-	16		1933.1024	1-	17		1933. 311	2-	3
*	1933. 311	2-	4		1930. 225	2-	5		1930. 126	2-	6		1928.1225	2-	7
	1928.1110	2-	8		1928. 415	2-	9		1927. 2 3	2-	10	*	1927. 131	3-	6
	1926.1027	3-	7		1922. 328	3-	8		1919.11 3	3-	9		1919. 4 8	2-	11
	1918.1013	3-	10		1917. 6 9	3-	11		1917. 5 8	2-	12	*	1917. 5 8	1-	18
	1909.1023	4-	3		1903.10 4	4-	4		1898. 414	1-	19		1895.1030	1-	20
*	1895.1030	1-	21	*	1895.1030	1-	22		1883.12 5	3-	12		1883. 110	1-	23
	1877. 715	3-	13	*	1877. 714	3-	14	*	1877. 714	3-	15		1871. 724	1-	24
	1820.11 9	3-	16												

Zone: WEMB   Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
RANGE mb:		3.0-3.4									
1	0	0	56		6.522	2	1	0	154		2.379
3	1	0	155	57	2.362	4	2	0	159	50	2.294
5	2	0	153	44	2.387	6	5	1	308	81	1.188
7	14	2	750	234	0.487	8	17	2	798	291	0.458
9	37	4	1505	481	0.243	10	38	4	1392	542	0.262
11	40	4	1325	566	0.276	12	43	4	1310	576	0.279
13	43	3	1211	571	0.302	14	46	3	1205	564	0.303
15	82	5	1990	631	0.184	16	84	5	1921	668	0.190
17	97	6	2083	708	0.175	18	108	6	2200	745	0.166
RANGE mb:		3.5-3.9									
1	16	16	5700		0.064	2	17	8	3050		0.120
3	47	16	5699	1530	0.064	4	50	12	4552	1256	0.080
5	50	10	3647	1194	0.100	6	51	9	3106	1216	0.118
7	51	7	2668	1269	0.137	8	52	6	2361	1319	0.155
9	53	6	2147	1358	0.170	10	61	6	2218	1359	0.165
11	63	6	2080	1360	0.176						
RANGE mb:		4.0-4.4									
1	8	8	2891		0.126	2	26	13	4732		0.077
3	32	11	3906	922	0.094	4	34	8	3071	846	0.119
5	43	9	3114	771	0.117	6	53	9	3221	702	0.113
7	53	8	2775	695	0.132						

Zone: WEMB   Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
8	58	7	2637	696	0.139						
9	60	7	2441	710	0.150	10	61	6	2236	736	0.163
11	63	6	2077	763	0.176	12	96	8	2924	728	0.125
13	102	8	2879	698	0.127	14	159	11	4152	739	0.088
RANGE mb:		4.5-4.9									
1	11	11	4016		0.091	2	17	8	3074		0.119
3	70	23	8545	2925	0.043	4	76	19	6962	2544	0.052



10 YEAR LISTING of Earthquakes by Magnitude

*** ZONE WEMB ***

YEAR \ mb	<3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979		6		1				
1960-1969		2	2		2			
1950-1959				1				
1940-1949		3		2				
1930-1939		3	3	1				
1920-1929			4	3				
1910-1919			2	3				
1900-1909					2			
1890-1899		2						
1880-1889		1		1				
1870-1879		1		1				
1860-1869								
1850-1859								
1840-1849								
1830-1839								
1820-1829				1				
1810-1819								
1800-1809								
1790-1799								
SUMS	0	18	11	14	4	0	0	0

\# of events = 47
EARLY YEAR = 1820
MIN mb = 3.0

RECENT YEAR = 1979
MAX mb = 4.7

10 YEAR LISTING of Recurrence Rate, R (#/yr), by Magnitude

*** ZONE WEMB ***

YEAR \ mb	<3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979		0.600		0.100				
1960-1979		0.400	0.100	0.050	0.100			
1950-1979		0.267	0.067	0.067	0.067			
1940-1979		0.275	0.050	0.100	0.050			
1930-1979		0.280	0.100	0.100	0.040			
1920-1979		0.233	0.150	0.133	0.033			
1910-1979		0.200	0.157	0.157	0.029			
1900-1979		0.175	0.138	0.138	0.050			
1890-1979		0.178	0.122	0.122	0.044			
1880-1979		0.170	0.110	0.120	0.040			
1870-1979		0.164	0.100	0.118	0.036			
1860-1979		0.150	0.092	0.108	0.033			
1850-1979		0.138	0.085	0.100	0.031			
1840-1979		0.129	0.079	0.093	0.029			
1830-1979		0.120	0.073	0.087	0.027			
1820-1979		0.113	0.069	0.0[illegible]8	0.025			
TOTAL #	0	18	11	14	4	0	0	0

10 YEAR LISTING of Earthquakes by max MM Intensity

*** ZONE WEMB ***

YEAR \ Io	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1970-1979			2	1	3	1						
1960-1969			2	2		2						
1950-1959						1						
1940-1949			3	2								
1930-1939		2	1	3	1							
1920-1929			1	6								
1910-1919				3	2							
1900-1909					1	1						
1890-1899			2									
1880-1889			1		1							
1870-1879			1	1								
1860-1869												
1850-1859												
1840-1849												
1830-1839												
1820-1829					1							
1810-1819												
1800-1809												
1790-1799												
SUMS	0	2	13	18	9	5	0	0	0	0	0	0

# of events = 47
EARLY YEAR = 1820 RECENT YEAR = 1979
MIN Io = II MAX Io = VI

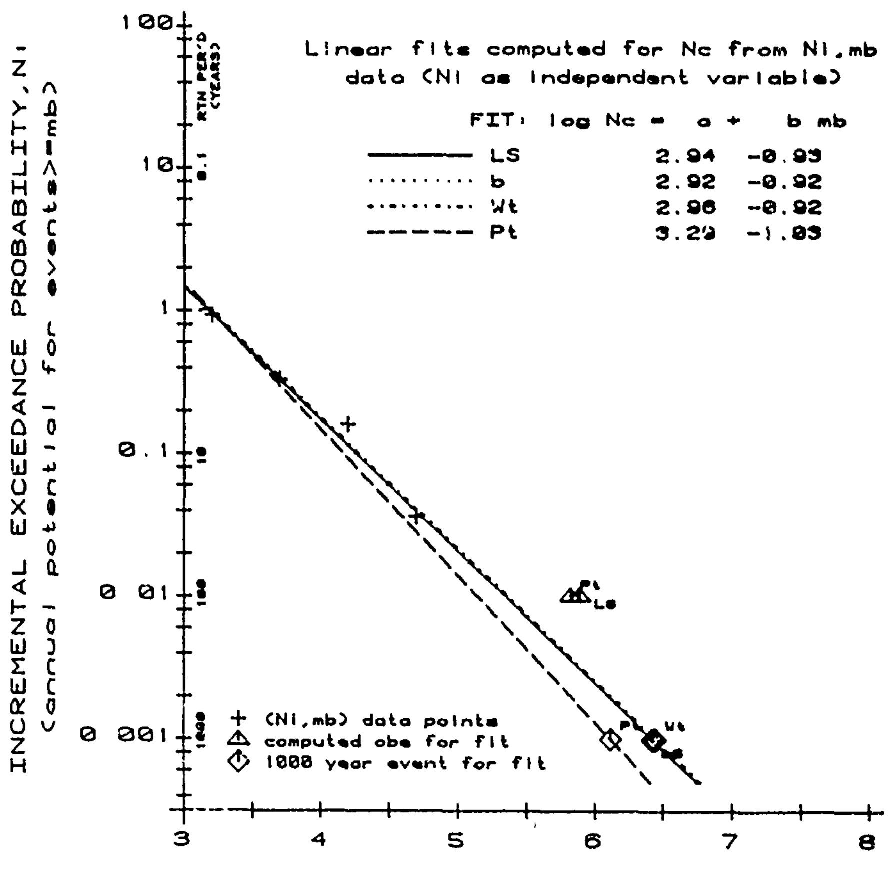
ZONE: West Embayment (AREA = 19.4 10↑3 sq km)

mb Range	Period of Calculation (years)	Number of Events	Occurrance Prob (per year)	Exceedence Prob, Ni (per year)	Exceedence Return Per'd (years)
> 5.9	160	0			
5.5-5.9	160	0			
5.0-5.4	120	0			
4.5-4.9	110	4	0.036	0.036	28
4.0-4.4	105	13	0.124	0.160	6
3.5-3.9	65	11	0.169	0.329	3
3.0-3.4	10	6	0.600	0.929	1

mb, Y data	Ni, X data	Period(years)	Weight
4.7	0.036	110	2
4.2	0.160	105	4
3.7	0.329	65	4
3.2	0.929	10	1

log Ni used as the independent variable; converted to Nc and resolved to the general form, log Nc on mb.

log Nc= a	+ b mb	r	s(e)	Nc(cal) (mb=3)	mb(cal) (Nc=E-3)	FIT
2.94	-0.93	-0.99	0.02	1.46	6.4	Least Squares
mb=3.95; ts(mb)=0.16; ts(b)=0.31; obe=5.9(320yrs)						
3.29	-1.03	-0.89	0.06	1.60	6.1	Con'd to 6.1,.001
mb=3.95; ts(mb)=0.20; ts(b)=0.39; obe=5.8(490yrs)						
2.92	-0.92	-1.00	0.01	1.45	6.4	Con'd to b=-.92
t(b)cal=0.05 < 2.92=t(10%)						
2.96	-0.92	-0.98	0.02	1.53	6.4	Wtd:1,4,4,2,2,1



OZARK RANDOM

Zone: OZRK　　　　Date List

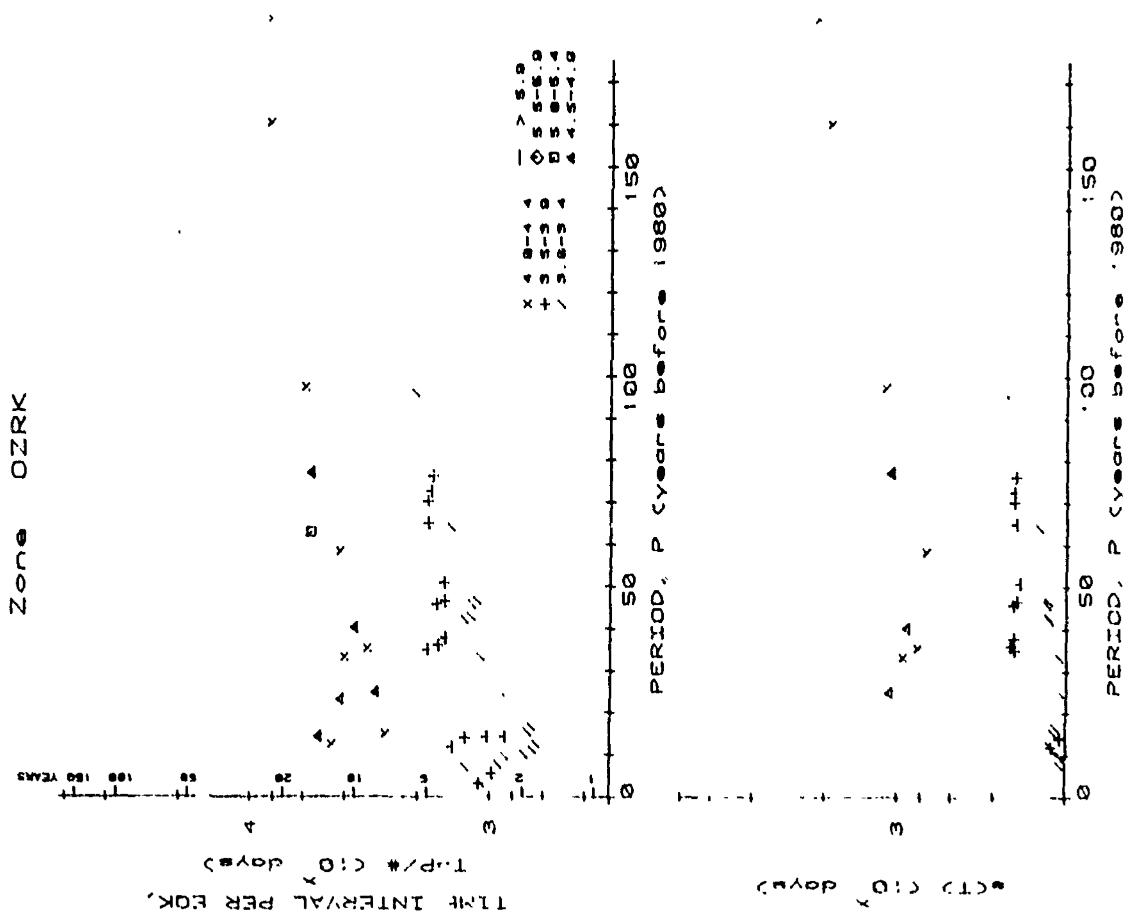
	Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#
0	1979. 912	0-	00	0	1977. 1 3	0-	00		1977. 1 3	1-	1		1976.1213	2-	1
0	1975. 824	0-	00	0	1975. 824	0-	00		1974. 811	2-	2		1973. 112	1-	2
	1972. 6 9	1-	3		1970. 7 6	1-	4		1970. 2 5	1-	5	*	1970. 2 5	1-	6
*	1970. 2 5	1-	7		1969. 120	1-	8		1968. 331	2-	3		1967. 825	1-	9
	1967. 721	3-	1		1966. 226	2-	4	*	1966. 213	1-	10	*	1966. 213	2-	5
	1965.1219	2-	6		1965.11 4	2-	7	*	1965.11 3	1-	11	*	1965.1020	4-	1
	1965. 3 6	3-	2		1964. 924	1-	12		1963. 7 8	1-	13		1956.1125	4-	2
	1955. 411	1-	14	*	1955. 4 9	4-	3		1949. 6 8	1-	15		1946.11 7	1-	16
	1946.10 7	3-	3		1945. 115	2-	8		1944. 925	3-	4		1944. 1 7	2-	9
	1942. 329	2-	10		1939.1123	4-	4		1938. 116	1-	17		1937. 318	1-	18
	1934. 515	2-	11		1934. 417	1-	19		1933. 8 3	2-	12		1933. 713	1-	20
	1929. 226	2-	13		1921.10 1	3-	5		1917. 4 9	5-	1	*	1917. 4 9	2-	14
	1916. 217	1-	21		1915. 2 5	2-	15		1909.1022	2-	16		1907. 7 4	2-	17
	1903.11 3	2-	10		1903. 2 8	4-	5		1884. 215	1-	22		1882. 728	3-	6
	1819. 9 2	3-	7		1795. 1 8	3-	8								

Zone: OZRK　　　　Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
RANGE mb:	3.0-3.4										
1	3	3	1092		0.334	2	7	3	1272		0.287
3	8	3	920	176	0.397	4	9	2	866	183	0.422
5	10	2	723	212	0.505	6	11	2	666	228	0.548
7	12	2	644	233	0.567	8	15	2	697	226	0.524
9	16	2	669	221	0.546	10	25	2	903	209	0.404
11	33	3	1101	213	0.332	12	42	3	1277	235	0.286
13	43	3	1202	239	0.304	14	46	3	1192	241	0.306
15	46	3	1131	237	0.323	16	64	4	1458	261	0.251
17	96	6	2060	362	0.177						
RANGE mb:	3.5-3.9										
1	3	3	1113		0.328	2	5	3	984		0.371
3	12	4	1431	230	0.255	4	14	3	1264	193	0.289
5	14	3	1027	184	0.356	6	14	2	862	205	0.424
7	35	5	1824	328	0.200	8	36	4	1643	339	0.222
9	38	4	1532	329	0.238	10	46	5	1667	331	0.219
11	46	4	1541	320	0.237	12	51	4	1548	311	0.236
13	65	5	1823	323	0.200	14	70	5	1831	331	0.199
15	72	5	1765	330	0.207	16	76	5	1739	326	0.210
RANGE mb:	4.0-4.4										
1	12	12	4546		0.080	2	15	7	2707		0.135
3	33	11	4046	951	0.090						

Zone: OZRK　　　　Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
4	35	9	3220	823	0.113						
5	58	12	4255	766	0.086	6	97	16	5931	1122	0.062
7	160	23	8366	1904	0.044	8	185	23	8445	2200	0.043
RANGE mb:	4.5-4.9										
1	14	14	5185		0.070	2	23	12	4218		0.087
3	25	8	3011	1089	0.121	4	40	10	3662	921	0.100
5	77	15	5617	1071	0.065						
RANGE mb:	5.0-5.4										
1	63	15	5617		0.065						



10 YEAR LISTING of Earthquakes by Magnitude

*** ZONE OZRK ***

YEAR \ mb	<3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979		5	2					
1960-1969		4	4	2	1			
1950-1959		1			2			
1940-1949		1	3	2				
1930-1939		4	2		1			
1920-1929			1	1				
1910-1919		1	1			1		
1900-1909			3		1			
1890-1899								
1880-1889		1		1				
1870-1879								
1860-1869								
1850-1859								
1840-1849								
1830-1839								
1820-1829								
1810-1819				1				
1800-1809								
1790-1799				1				
SUMS	0	17	16	8	5	1	0	0

# of events = 47
EARLY YEAR = 1795
MIN mb = 3.0

RECENT YEAR = 1977
MAX mb = 5.0

10 YEAR LISTING of Recurrence Rate, R (#/yr), by Magnitude

*** ZONE OZRK ***

YEAR \ mb	<3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979		0.500	0.200					
1960-1979		0.450	0.300	0.100	0.050			
1950-1979		0.333	0.200	0.067	0.100			
1940-1979		0.275	0.225	0.100	0.075			
1930-1979		0.300	0.220	0.080	0.080			
1920-1979		0.250	0.200	0.083	0.067			
1910-1979		0.229	0.186	0.071	0.057	0.014		
1900-1979		0.200	0.200	0.063	0.063	0.013		
1890-1979		0.178	0.178	0.056	0.056	0.011		
1880-1979		0.170	0.160	0.060	0.050	0.010		
1870-1979		0.155	0.145	0.055	0.045	0.009		
1860-1979		0.142	0.133	0.050	0.042	9.008		
1850-1979		0.131	0.123	0.046	0.038	0.008		
1840-1979		0.121	0.114	0.043	0.036	0.007		
1830-1979		0.113	0.107	9.040	0.033	0.007		
1820-1979		0.106	0.100	0.038	0.031	0.006		
TOTAL #	0	17	16	6	5	1	0	0

10 YEAR LISTING of Earthquakes by max MM Intensity

*** ZONE OZRK ***

YEAR \ Io	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1970-1979		2		2	2	1						
1960-1969			5	4		2						
1950-1959		1				2						
1940-1949			1	4	1							
1930-1939			4	2	1							
1920-1929				2								
1910-1919			1	1		1						
1900-1909				2	1	1						
1890-1899												
1880-1889			1	1								
1870-1879												
1860-1869												
1850-1859												
1840-1849												
1830-1839												
1820-1829												
1810-1819					1							
1800-1809												
1790-1799					1							
SUMS	0	3	12	18	7	7	0	0	0	0	0	0

# of events = 47
EARLY YEAR = 1795
MIN Io = II

RECENT YEAR = 1977
MAX Io = VI

ZONE: Ozark Random (AREA = 22.3 10↑3 sq km)

Mb Range	Period of Calculation (years)	Number of Events	Occurrance Prob (per year)	Exceedence Prob, Ni (per year)	Exceedence Return Per'd (years)
> 5.9	160	0			
5.5-5.9	160	0			
5.0-5.4	120	1	0.008	0.008	120
4.5-4.9	100	5	0.050	0.058	17
4.0-4.4	100	6	0.060	0.118	8
3.5-3.9	55	12	0.218	0.337	3
3.0-3.4	10	5	0.500	0.837	1

Mb,Y data	Ni,X data	Period(years)	Weight
5.2	0.008	120	2
4.7	0.058	100	2
4.2	0.118	100	4
3.7	0.337	55	4
3.2	0.837	10	1

log Ni used as the independent variable; converted to Nc and resolved to the general form, log Nc on mb.

log Nc= a	+ b mb	r	s(e)	Nc(cal) (mb=3)	mb(cal) (Nc=E-3)	FIT
3.12	-0.98	_-0.98	0.03_	1.47	6.2	Least Squares

mb=4.20; ts(mb)=0.17; ts(b)=0.25; obe=5.7(300yrs)

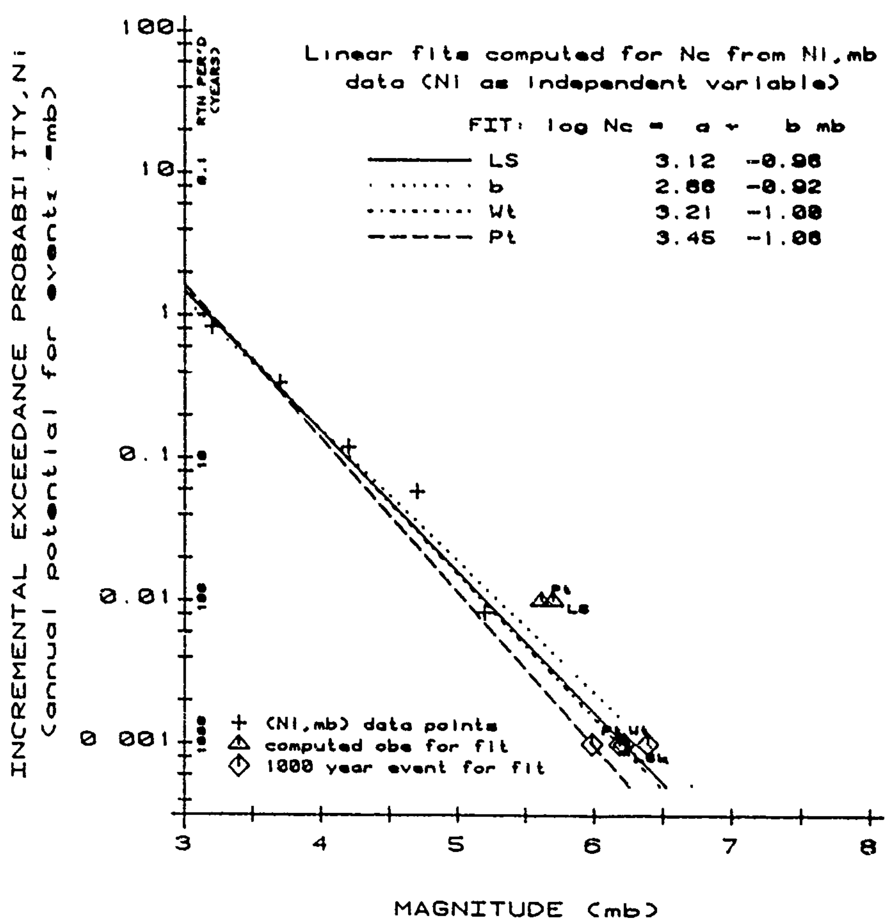
3.45	-1.08	_-0.90	0.08_	1.65	6.0	Con'd to 6,.001

mb=4.20; ts(mb)=0.19; ts(b)=0.28; obe=5.6(390yrs)

2.88	-0.92			1.32	6.4	Con'd to b=-.92

t(b)cal=0.60 < 2.35=t(10%)

3.21	-1.00	-0.98	0.02	1.57	6.2	Wtd:1,4,4,2,2,1



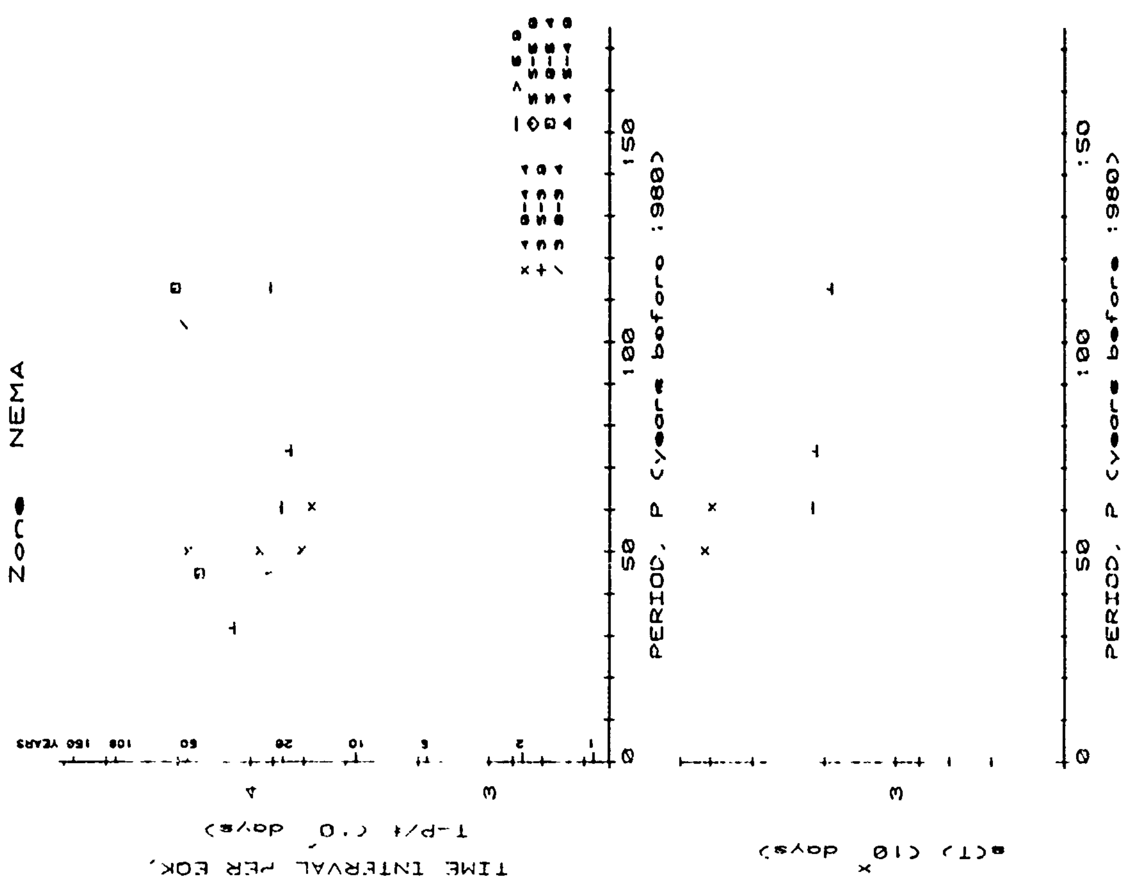
NEMAHA

Zone: NEMA — Date List

	Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#
	1969. 630	1-	1		1948. 4 2	2-	1		1935. 322	2-	2		1935. 3 1	5-	1
*	1935. 3 1	1-	2	0	1934.11 7	0-	00		1929.12 7	3-	1		1929.1023	1-	3
*	1929.1021	3-	2		1929. 923	3-	3	*	1929. 923	3-	4		1919. 726	1-	4
*	1919. 726	2-	3		1919. 526	3-	5		1906. 123	1-	5	*	1906. 123	1-	6
*	1906. 119	1-	7	*	1906. 115	2-	4	*	1906. 114	1-	8	*	1906. 1 8	1-	9
*	1906. 1 8	1-	10	*	1906. 1 8	6-	1	*	1906. 1 8	1-	11	*	1906. 1 8	1-	12
	1875.12 9	1-	13		1867. 428	2-	5	*	1867. 424	5-	2				

Zone: NEMA — Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
RANGE mb: 3.0-3.4											
1	11	11	3836		0.095	2	104	52	19004		0.019
RANGE mb: 3.5-3.9											
1	32	32	11595		0.032	2	45	22	8178		0.045
3	60	20	7358	2247	0.050	4	74	18	6753	2163	0.054
5	113	23	8231	1876	0.044						
RANGE mb: 4.0-4.4											
1	50	50	18286		0.020	2	50	25	9167		0.040
3	50	17	6120	6330	0.060	4	61	15	5534	5892	0.066
RANGE mb: 5.0-5.4											
1	45	45	16376		0.022	2	113	56	20579		0.018



10 YEAR LISTING of Earthquakes by Magnitude

*** ZONE NEMA ***

YEAR	mb <3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979								
1960-1969		1						
1950-1959								
1940-1949			1					
1930-1939			1			1		
1920-1929				3				
1910-1919			1	1				
1900-1909			1					
1890-1899								
1880-1889								
1870-1879		1						
1860-1869			1			1		
1850-1859								
1840-1849								
1830-1839								
1820-1829								
1810-1819								
1800-1809								
1790-1799								
SUMS	0	2	5	4	0	2	0	0

\# of events = 13
EARLY YEAR = 1867 RECENT YEAR = 1969
MIN mb = 3.0 MAX mb = 5.3

10 YEAR LISTING of Recurrence Rate, R (#/yr), by Magnitude

*** ZONE NEMA ***

YEAR	mb <3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979								
1960-1979		0.050						
1950-1979		0.033						
1940-1979		0.025	0.025					
1930-1979		0.020	0.040			0.020		
1920-1979		0.017	0.033	0.050		0.017		
1910-1979		0.014	0.043	0.057		0.014		
1900-1979		0.013	0.050	0.050		0.013		
1890-1979		0.011	0.044	0.044		0.011		
1880-1979		0.010	0.040	0.040		0.010		
1870-1979		0.018	0.036	0.036		0.009		
1860-1979		0.017	0.042	0.033		0.017		
1850-1979		0.015	0.038	0.031		0.015		
1840-1979		0.014	0.036	0.029		0.014		
1830-1979		0.013	0.033	0.027		0.013		
1820-1979		0.013	0.031	0.025		0.013		
TOTAL #	0	2	5	4	0	2	0	0

10 YEAR LISTING of Earthquakes by max MM Intensity

*** ZONE NEMA ***

YEAR (Io)	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1970-1979												
1960-1969			1									
1950-1959												
1940-1949				1								
1930-1939				1			1					
1920-1929					3							
1910-1919				2								
1900-1909				1								
1890-1899												
1880-1889												
1870-1879			1									
1860-1869				1			1					
1850-1859												
1840-1849												
1830-1839												
1820-1829												
1810-1819												
1800-1809												
1790-1799												
SUMS	0	0	2	6	3	0	2	0	0	0	0	0

\# of events = 13
EARLY YEAR = 1867 RECENT YEAR = 1969
MIN Io = III MAX Io = VII

ZONE: Nemaha (AREA = 25.1 10↑3 sq km)

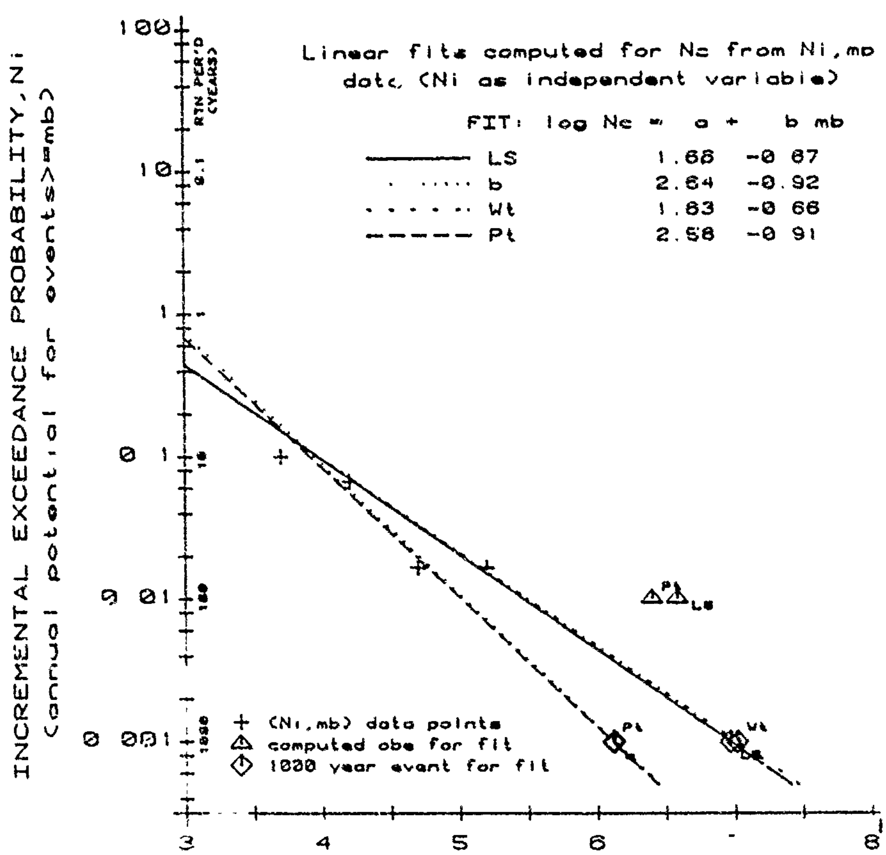
mb Range	Period of Calculation (years)	Number of Events	Occurrance Prob (per year)	Exceedence Prob, Ni (per year)	Exceedence Return Per'd (years)
> 5.9	160	0			
5.5-5.9	160	0			
5.0-5.4	120	2	0.017	0.017	60
4.5-4.9	100	0	0.000	0.017	60
4.0-4.4	80	4	0.050	0.067	15
3.5-3.9	60	2	0.033	0.100	10
3.0-3.4	0	0			

mb,Y data	Ni,X data	Period(years)	Weight
5.2	0.017	120	2
4.7	0.017	100	2
4.2	0.067	80	4
3.7	0.100	60	4

log Ni used as the independent variable; converted to Nc and resolved to the general form, log Nc on mb.

log Nc= a	+ b mb	r	s(e)	Nc(cal) (mb=3)	mb(cal) (Nc=E-3)	FIT
1.66	-0.67	_-0.94	0.10_	0.45	7.0	Least Squares
		mb=4.45; ts(mb)=0.41; ts(b)=1.16; obe=6.6(560yrs)				
2.58	-0.91	_-0.69	0.25_	0.69	6.1	Con'd to 6.1,.001
		mb=4.45; ts(mb)=0.50; ts(b)=1.43; obe=6.4(1840yrs)				
2.64	-0.92	-0.68	0.25	0.75	6.1	Con'd to b=-.92
		t(b)cal=(.63 < 2.92=t(10%)				
1.63	-0.66	-0.95	0.06	0.45	7.0	Wtd:1,4,4,2,2,1

Zone Nemaha



CENTRAL US RANDOM

Zone: cUS Date List

	Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#
	1918.1015	4-	5		1918. 7 1	2-	31	0	1917. 125	0-	00		1916. 1 7	2-	32
	1913.1111	2-	33		1913.1016	2-	34		1913. 6 9	2-	35		1912. 1 2	4-	6
	1911. 228	2-	36		1909.1022	1-	56	*	1909.1022	3-	16		1909. 927	5-	1
*	1909. 922	3-	17		1909. 816	3-	18		1909. 718	5-	2		1908.1112	2-	37
	1907.1210	2-	38		1907. 130	3-	19	*	1907. 129	3-	20		1906.1123	1-	57
	1906. 813	2-	39		1906. 5 9	2-	40	*	1906. 5 8	2-	41		1906. 3 6	2-	42
*	1906. 223	1-	58		1905. 822	1-	59		1905. 413	3-	21		1903.1211	1-	60
	1903.1120	1-	61		1903. 920	2-	43		1903. 317	2-	44		1903. 113	1-	62
	1902. 124	4-	7		1901. 1 3	3-	22		1899.12 1	2-	45		1898. 329	1-	63
	1897.12 2	4-	8		1895. 727	2-	46	*	1895. 719	3-	23		1894. 718	1-	64
	1889. 6 6	2-	47		1886. 813	2-	48		1886. 3 1	2-	49		1885.1226	1-	65
	1885. 221	1-	66		1884. 331	1-	67		1883.1114	2-	50		1882.1115	2-	51
	1882.1022	1-	68	*	1882.1015	3-	24	*	1882.1014	3-	25		1882. 927	4-	9
	1881. 527	4-	10	*	1881. 519	1-	69		1880.1130	1-	70		1877. 6 3	1-	71
	1875.11 8	3-	26		1872. 7 8	2-	52		1871. 725	2-	53		1869. 220	3-	27
	1854. 3 8	2-	54	*	1854. 228	3-	28		1850. 4 4	3-	29		1843. 8 9	3-	30
	1843. 216	3-	31		1834.1120	3-	32		1829. 5 0	1-	72		1827. 814	1-	73
*	1827. 8 7	4-	11	*	1827. 8 6	4-	12		1827. 7 5	4-	13		1819. 917	2-	55
*	1819. 916	2-	56		1818. 411	2-	57								

Zone: cUS Date List

	Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#		Year.MoDa	M-	#
0	1979.1011	0-	00		1978. 920	1-	1	0	1978. 216	0-	00		1977. 617	1-	2
0	1977. 228	0-	00	0	1976. 613	0-	00		1976. 415	1-	3	*	1976. 4 8	1-	4
0	1974.1213	0-	00	0	1974.1125	0-	00	0	1974. 822	0-	00		1974. 6 5	2-	1
*	1974. 6 4	2-	2	*	1974. 6 4	2-	3	0	1974. 4 5	0-	00	0	1974. 327	0-	00
0	1973. 418	0-	00		1973. 1 7	1-	5		1972. 914	3-	1		1968.1211	1-	6
0	1967. 8 5	0-	00		1966.12 6	1-	7		1965. 214	1-	8		1963.1214	1-	9
*	1963.12 5	1-	10		1961.1225	2-	4	*	1961.1225	2-	5		1961. 9 9	2-	6
	1959. 812	4-	1	*	1959. 812	3-	2		1959. 1 6	1-	11		1957. 423	3-	3
	1956. 9 9	2-	7		1956. 313	2-	8		1953. 911	4-	2		1952. 1 7	1-	12
	1951. 919	2-	9		1950. 916	2-	10		1950. 2 8	3-	4		1949. 826	1-	13
	1949. 811	1-	14		1948. 420	2-	11		1947. 629	4-	3		1945. 521	2-	12
	1945. 327	1-	15		1943. 6 8	2-	13		1943. 524	1-	16	*	1943. 520	1-	17
	1943. 418	2-	14	*	1943. 413	2-	15		1942.1227	1-	18		1942.1117	1-	19
*	1942.1117	2-	16		1942. 3 1	3-	5		1942. 130	1-	20	*	1942. 129	1-	21
*	1942. 123	1-	22	*	1942. 114	1-	23	0	1942. 014	0-	00		1941.1115	1-	24
	1941. 1 0	1-	25		1940. 527	1-	26		1940. 1 8	1-	27		1939.1124	1-	28
	1939. 624	1-	29	*	1939. 624	2-	17	*	1939. 624	1-	30		1937.1016	1-	31
	1937. 8 5	1-	32		1937. 629	1-	33		1936.1225	1-	34	*	1936.1225	1-	35
	1935.1029	1-	36		1935. 226	1-	37		1935. 130	1-	38		1935. 1 5	3-	6
*	1935. 1 5	1-	39		1934.1112	4-	4	*	1934.1029	2-	10		1933.1116	2-	19
	1931.1217	1-	40		1931.1127	1-	41		1931. 8 9	3-	7	*	1931. 8 9	1-	42
*	1931. 8 9	1-	43		1931. 1 5	3-	8	*	1930.1223	2-	20		1930. 8 8	2-	21
	1930. 528	1-	44		1928. 317	1-	45	*	1928. 3 6	1-	46		1928. 123	2-	22
	1927. 310	3-	9		1925. 713	3-	10	*	1925. 7 8	2-	23		1925. 4 4	1-	47
	1925. 127	2-	24		1923.1128	1-	48		1923.11 9	3-	11		1923. 327	2-	25
	1923. 3 8	2-	26		1922. 410	1-	49	*	1922. 329	2-	27		1921.10 9	2-	28
*	1921.10 9	1-	50		1921. 921	1-	51	*	1921. 9 6	3-	12	*	1921. 9 8	1-	52
*	1921. 9 2	1-	53	*	1921. 9 2	1-	54		1921. 314	3-	13		1920.10 3	2-	29
	1920. 5 7	2-	3[illegible]	*	1920. 5 1	3-	14	*	1920. 5 1	1-	55		1920. 228	3-	15

Zone: cUS Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
RANGE mb:		3.0-3.4									
1	1	1	467		0.782	2	3	1	464		0.788
3	4	1	452	8	0.809	4	4	1	341	60	1.073
5	7	1	510	63	0.716	6	11	2	673	108	0.543
7	13	2	682	124	0.536	8	15	2	679	129	0.538
9	16	2	651	127	0.561	10	21	2	766	138	0.477
11	28	3	929	170	0.393	12	30	3	924	187	0.395
13	30	2	854	190	0.428	14	35	2	907	195	0.403
15	37	2	892	197	0.410	16	37	2	845	195	0.432
17	38	2	815	191	0.448	18	38	2	770	186	0.474
19	38	2	733	181	0.498	20	39	2	712	176	0.513
21	40	2	689	172	0.530	22	40	2	664	168	0.550
23	40	2	637	165	0.574	24	42	2	642	162	0.569
25	42	2	620	159	0.590	26	43	2	597	157	0.612
27	43	2	582	155	0.628	28	44	2	576	154	0.634
29	45	2	565	152	0.647	30	45	1	547	152	0.668
31	48	2	566	150	0.645	32	48	2	549	149	0.665
33	50	2	549	148	0.665	34	52	2	556	147	0.657
35	52	1	541	146	0.675	36	55	2	555	145	0.658
37	56	2	554	144	0.660	38	58	2	555	143	0.658
39	58	1	546	142	0.669	40	58	1	533	141	0.686
41	70	2	625	140	0.584	42	73	2	636	138	0.575
43	74	2	627	136	0.582	44	74	2	617	135	0.592

Zone: cUS Recurrence List

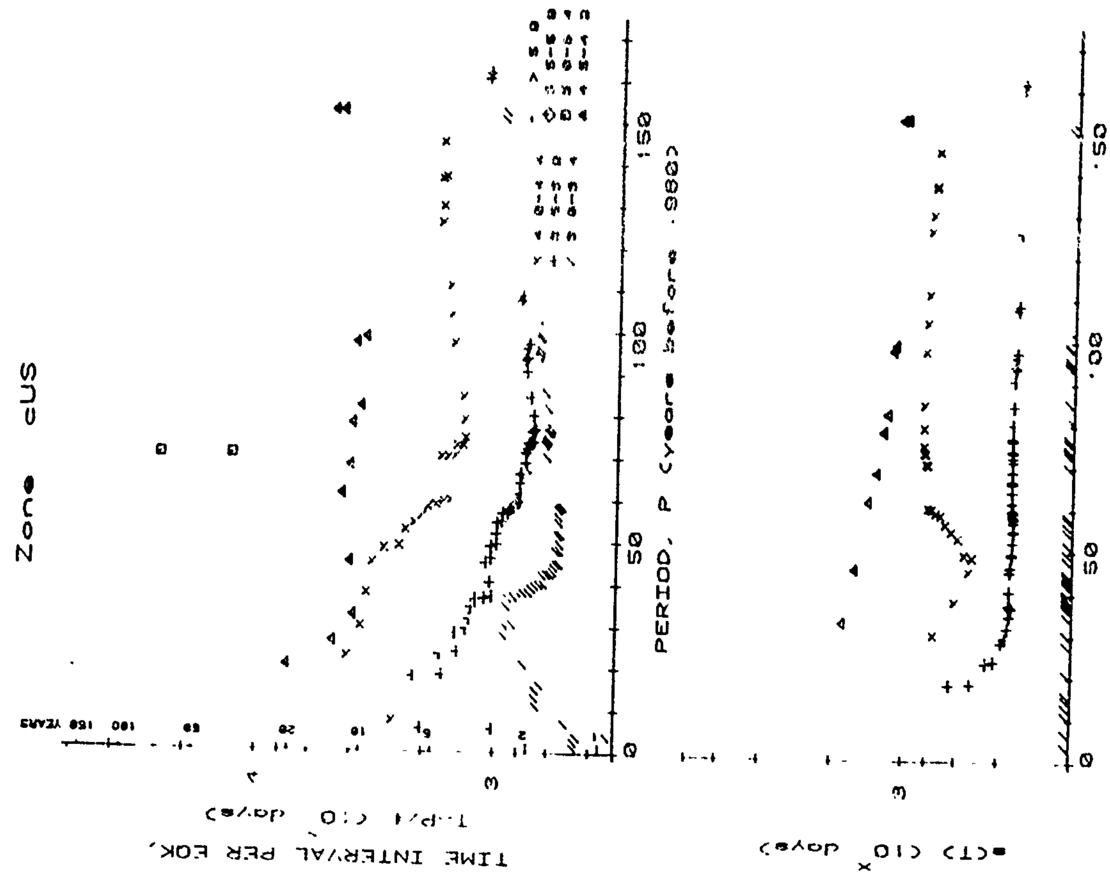
#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
45	76	2	617	133	0.592	46	76	2	604	132	0.604
47	77	2	598	131	0.611	48	82	2	622	129	0.587
49	85	2	637	128	0.573	50	94	2	687	127	0.532
51	95	2	679	126	0.538	52	96	2	673	124	0.543
53	99	2	680	123	0.537	54	99	2	670	122	0.545
55	103	2	681	121	0.536	56	151	3	983	128	0.372
57	152	3	976	134	0.374						
RANGE mb:		3.5-3.9									
1	6	6	2035		0.179	2	6	3	1018		0.359
3	18	6	2193	638	0.167	4	18	5	1672	522	0.218
5	23	5	1703	452	0.215	6	24	4	1449	420	0.252
7	28	4	1476	391	0.248	8	29	4	1337	378	0.273
9	32	4	1286	370	0.284	10	35	3	1264	362	0.289
11	37	3	1214	358	0.301	12	37	3	1118	360	0.327
13	37	3	1043	365	0.350	14	41	3	1057	366	0.346
15	45	3	1100	362	0.332	16	46	3	1053	360	0.347
17	49	3	1053	358	0.347	18	49	3	1002	357	0.364
19	52	3	998	355	0.366	20	54	3	995	353	0.367
21	55	3	955	353	0.382	22	57	3	942	352	0.388
23	57	2	902	352	0.405	24	58	2	879	353	0.416
25	58	2	851	354	0.429	26	59	2	832	356	0.439
27	60	2	807	357	0.453	28	62	2	802	358	0.455
29	64	2	806	359	0.453	30	66	2	805	358	0.454
31	66	2	780	359	0.468	32	67	2	760	359	0.481
33	69	2	762	360	0.479	34	71	2	764	359	0.478
35	72	2	752	359	0.486	36	73	2	745	359	0.491
37	74	2	727	359	0.502						

Zone: cUS Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
38	74	2	710	359	0.515						
39	76	2	714	359	0.511	40	77	2	701	359	0.521
41	80	2	713	358	0.512	42	84	2	734	357	0.497
43	91	2	769	355	0.475	44	93	2	775	353	0.471
45	94	2	762	351	0.480	46	96	2	763	349	0.479
47	97	2	755	347	0.484	48	107	2	818	345	0.447
49	108	2	808	342	0.452	50	126	3	919	339	0.397
51	160	3	1148	336	0.318	52	162	3	1136	333	0.322
RANGE mb:		4.0-4.4									
1	7	7	2664		0.137	2	23	11	4144		0.088
3	30	10	3639	752	0.100	4	38	9	3455	614	0.106
5	45	9	3286	539	0.111	6	48	8	2946	522	0.124
7	49	7	2556	564	0.143	8	53	7	2410	599	0.152
9	54	6	2210	640	0.165	10	56	6	2051	679	0.178
11	58	5	1936	711	0.189	12	59	5	1790	743	0.204
13	60	5	1676	772	0.218	14	60	4	1561	799	0.234
15	70	5	1709	804	0.214	16	70	4	1604	811	0.228
17	70	4	1512	819	0.242	18	73	4	1480	825	0.247
19	73	4	1402	832	0.261	20	75	4	1365	837	0.268
21	79	4	1374	839	0.266	22	84	4	1402	837	0.261
23	97	4	1544	829	0.237	24	104	4	1585	820	0.230
25	111	4	1620	809	0.226	26	126	5	1768	796	0.207
27	130	5	1755	783	0.208	28	136	5	1779	771	0.205
29	137	5	1724	760	0.212	30	145	5	1767	740	0.207
RANGE mb:		4.5-4.9									
1	20	20	7446		0.049						

Zone: cUS Recurrence List

#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)	#	P (yr)	T (yr)	T (da)	s(T) (da)	R (#/yr)
2	26	13	4804		0.076						
3	33	11	3958	1820	0.092	4	45	11	4121	1618	0.089
5	61	12	4471	1428	0.082	6	68	11	4139	1320	0.088
7	78	11	4066	1239	0.090	8	82	10	3747	1197	0.097
9	97	11	3947	1140	0.093	10	99	10	3601	1114	0.101
11	152	14	5060	1073	0.072	12	152	13	4641	1024	0.079
RANGE mb:		5.0-5.4									
1	70	70	25662		0.014	2	70	35	12867		0.028



10 YEAR LISTING of Earthquakes by Magnitude

*** ZONE cUS ***

YEAR \ mb	<3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979		5	2	1				
1960-1969		4	2					
1950-1959		2	4	2	2			
1940-1949		11	5	1	1			
1930-1939		11	5	3	1			
1920-1929		7	9	7				
1910-1919			6		2			
1900-1909		7	7	7	1	2		
1890-1899		2	2	1	1			
1880-1889		5	5	1	2			
1870-1879		1	2	1				
1860-1869				1				
1850-1859			1	2				
1840-1849				2				
1830-1839				1				
1820-1829		2			2			
1810-1819			2					
1800-1809								
1790-1799								
SUMS	0	57	52	30	12	2	0	0

# of events = 153
EARLY YEAR = 1810
MIN mb = 3.0

RECENT YEAR = 1978
MAX mb = 5.3

10 YEAR LISTING of Recurrence Rate, R (#/yr), by Magnitude

*** ZONE cUS ***

YEAR \ mb	<3	3-3.4	3.5-3.9	4-4.4	4.5-4.9	5-5.4	5.5-5.9	>5.9
1970-1979		0.500	0.200	0.100				
1960-1979		0.450	0.200	0.050				
1950-1979		0.367	0.267	0.100	0.067			
1940-1979		0.550	0.325	0.100	0.075			
1930-1979		0.660	0.360	0.140	0.080			
1920-1979		0.667	0.450	0.233	0.067			
1910-1979		0.571	0.471	0.200	0.086			
1900-1979		0.588	0.500	0.263	0.088	0.025		
1890-1979		0.544	0.467	0.244	0.089	0.022		
1880-1979		0.540	0.470	0.230	0.100	0.020		
1870-1979		0.500	0.445	0.218	0.091	0.018		
1860-1979		0.458	0.408	0.208	0.083	0.017		
1850-1979		0.423	0.385	0.208	0.077	0.015		
1840-1979		0.393	0.357	0.207	0.071	0.014		
1830-1979		0.367	0.333	0.200	0.067	0.013		
1820-1979		0.356	0.313	0.188	0.075	0.013		
TOTAL #	0	57	50	30	12	2	0	0

10 YEAR LISTING of Earthquakes by max MM Intensity

*** ZONE cUS ***

YEAR \ Io	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
1970-1979			1		3	4						
1960-1969			3	1	2							
1950-1959			3	4	1	2						
1940-1949		2	9	5	1	1						
1930-1939		2	9	6	2	1						
1920-1929		3	8	8	3	1						
1910-1919			2	4	1	1						
1900-1909		2	5	8	6	1	2					
1890-1899			2	3		1						
1880-1889		1	5	6	1							
1870-1879			2	1	1							
1860-1869					1							
1850-1859				1	2							
1840-1849				2								
1830-1839					1							
1820-1829			2	1		1						
1810-1819				2								
1800-1809												
1790-1799												
SUMS	0	10	51	52	25	13	2	0	0	0	0	0

# of events = 153
EARLY YEAR = 1810
MIN Io = II

RECENT YEAR = 1978
MAX Io = VII

ZONE: central U. S. (AREA = 544.0 10↑3 sq km)

mb Range	Period of Calculation (years)	Number of Events	Occurrance Prob (per year)	Exceedence Prob, Ni (per year)	Exceedence Return Per'd (years)
> 5.9	160	0			
5.5-5.9	160	0			
5.0-5.4	120	2	0.017	0.017	60
4.5-4.9	100	10	0.100	0.117	9
4.0-4.4	80	21	0.263	0.379	3
3.5-3.9	50	18	0.360	0.739	1
3.0-3.4	0	0			

ZONE: central U. S. (AREA = -100.0 10↑3 sq km)

mb,Y data	Ni,X data	Period(years)	Weight
5.2	0.003	120	2
4.7	0.021	100	2
4.2	0.070	80	4
3.7	0.136	50	4

log Ni used as the independent variable; converted to Nc and resolved to the general form, log Nc on mb.

log Nc= a	+ b mb	r	s(e)	Nc(cal) (mb=3)	mb(cal) (Nc=E-3)	FIT
3.43	-1.15	-0.97	0.04	0.98	5.6	Least Squares

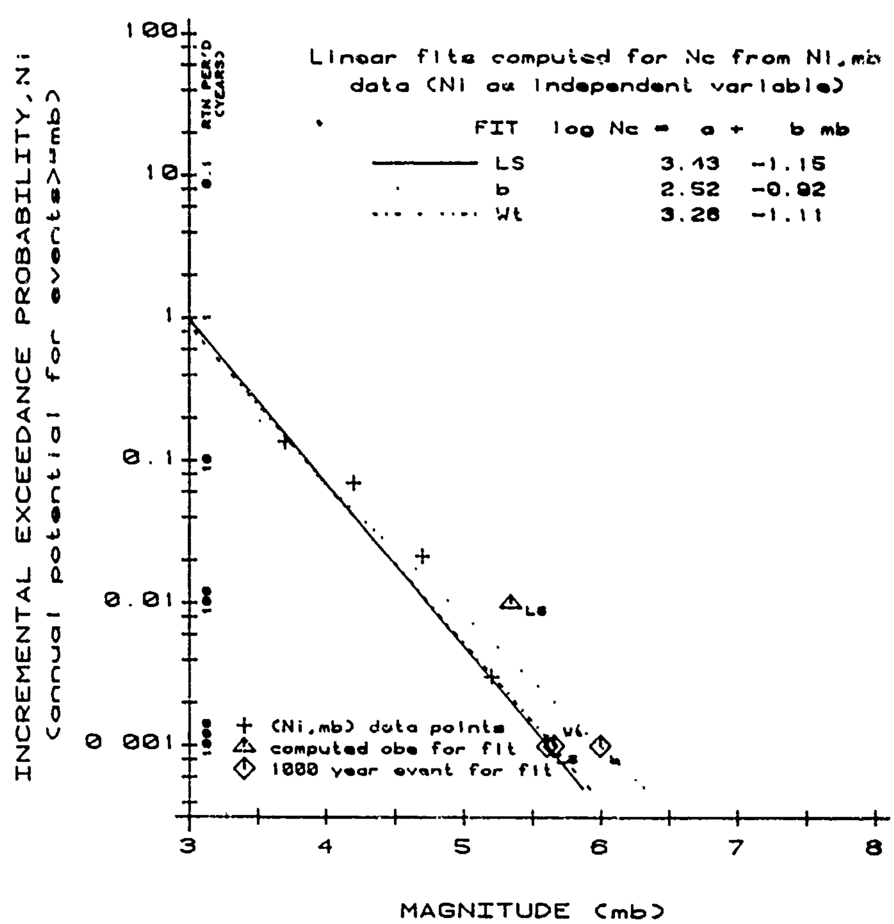
mb=4.45; ts(mb)=0.26; ts(b)=0.41; obe=5.3(490yrs)

log Nc= a	+ b mb	r	s(e)	Nc(cal) (mb=3)	mb(cal) (Nc=E-3)	FIT
2.52	-0.92			0.57	6.0	Con'd to b=-.92

t(b)cal=1.62 < 2.92=t(10%)

log Nc= a	+ b mb	r	s(e)	Nc(cal) (mb=3)	mb(cal) (Nc=E-3)	FIT
3.28	-1.11	-0.97	0.03	0.89	5.7	Wtd:1,4,4,2,2,1

Zone central U. S.



APPENDIX C

Bibliography

BIBLIOGRAPHY

Ahlberg, J. E., et al. "Earthquake Resistance of Earth and Rock-Fill Dams: Analysis of Response of Rifle Gap Dam to Project Rulison Underground Nuclear Detonation," Miscellaneous Paper S-71-17, Report 2. United States Army Engineer Waterways Experiment Station. 1972.

Algermissen, S. T., and David M. Perkins. "A Technique for Seismic Zoning: General Consideration and Parameters," Technical Report ERL 267-ESL 30. National Oceanic and Atmospheric Administration. Boulder, Colorado. 1973.

Ang, Alfredo H. S., and Wilson H. Tang. Probability Concepts in Engineering Planning and Design - Volume I, Basic Principles. New York, New York: John Wiley and Sons, Inc. 1975.

Applied Technology Council. "Tentative Provisions for the Development of Seismic Regulations for Buildings," National Bureau of Standards Special Publication 510. Washington, D.C.: United States Government Printing Office. 1978.

ASCE Geotechnical Engineering Division. Earthquake Engineering and Soil Dynamics, Volumes 1, 2, and 3. American Society of Civil Engineers, New York, New York. 1978.

Arkansas Geological Commission. Aeromagnetic Survey, Northwestern Arkansas. Map. 1967.

Arkansas Geological Commission. Contour Map for Aeromagnetic Survey, Northeastern Arkansas. Map. 1977.

Arkansas Power and Light Co. Arkansas Nuclear One, Unit 2. Preliminary Safety Analysis Report. 1-3. 1971.

Atherton, Elwood. "Tectonic Development of the Eastern Interior Region of the United States," Illinois Petroleum 96. Illinois State Geological Survey. 1971.

Bayley, Richard W., and William R. Muehlburger. Basement Rock Map of the United States. Map United States Geological Survey. 1968.

Bauhof, Frederick C. Geology, Seismicity, and Anticipated Earthquake Ground Motions in Creve Coeur Quadrangle, St. Louis County, Missouri. University of Missouri - Rolla, M.S. Thesis (unpublished). Rolla, Missouri. 1979.

Barstow, N. L., and P. W. Pomeroy. "Seismic Zonation in the United States," 1980 Midwest Meeting Program. American Geophysical Union, Abstract, Pg. 19, S-8. 1980.

Bingham, Roy H., and Robert L. Moore. "Reconnaissance of the Water Resources of the Oklahoma City Quadrangle, Central Oklahoma," Oklahoma Geological Survey Hydrologic Atlas 4. Map. Oklahoma Geological Survey. 1975.

Blakely, Robert F., and Madan M. Varma. "The Seismicity of Indiana Described by Return Periods of Earthquake Intensities," Indiana Geological Survey Occasional Paper 16. Indiana Department of Natural Resources. Bloomington, Indiana. 1976.

Bollinger, G. A. "Seismicity of the Southeastern United States." Bulletin of the Seismological Society of America. 63(5):1785-1808. 1973.

Bollinger, G. A. "A Catalog of Southeastern United States Earthquakes 1754 through 1974," Department of Geological Sciences Research Division Bulletin 101. Virginia Polytechnic Institute and State University. 1975.

Bollinger, G. A., et al. "Seismicity of the Southeastern United States," Southeastern U.S. Seismic Network Bulletin Nos. (1-5). 1978 - 1980.

Bolt, B. A., et al. Geological Hazards: Earthquakes - Tsunamis - Volcanoes - Avalanches - Landslides-Floods. Springer-Verlag, Berlin Heidelberg. 1975.

Bolt, Bruce A. Earthquakes: A Primer. W. H. Freeman and Company, San Francisco, California. 1978a.

Bolt, Bruce A., et al. "Optimum Station Distribution and Determination of Hypocenters for Small Seismographic Networks," Miscellaneous Paper S-78-9, Final Report. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1978b.

Borella, Peter E., and Robert H. Osborne. "Late Middle and Early Late Ordovician History of the Cincinnati Arch Province, Central Kentucky to Central Tennessee," Geological Society of America Bulletin. 89(10):1559-1573. 1978.

Bradley, Edward A., et al. "Earthquake History of Ohio," Bulletin of the Seismological Society of America. 55(4):745-752. 1965.

Braile, L. W., et al. "A Model for Intraplate Seismicity of Eastern North America," 1979 Midwest Meeting Program. American Geophysical Union, Abstract, Pg. 6, G-5. 1979.

Brazee, Rutlage J. "Final Report, An Analysis of Earthquake Intensities with Respect to Attenuation, Magnitude, and Rate of Recurrence," NOAA Technical Memorandum EDS NGSDC-2. National Oceanic and Atmospheric Administration. 1976.

Brazee, Rutlage J. "Reevaluation of Modified Mercalli Intensity Scale for Earthquakes Using Distance as Determinant," Bulletin of the Seismological Society of America. 69(3):911-924. 1979.

Bristol, H. M., and T. C. Buschbach. "Ordovician Galena Group (Trenton) of Illinois - Structure and Oil Fields," Illinois Petroleum 99. Illinois State Geological Survey. 1973a.

Bristol, H. M., and T. C. Buschbach. "Structure on Top of the Galena Group (Trenton) in Illinois," Illinois Petroleum 99 - Plate One. Illinois State Geological Survey. 1973b.

Brownfield, Robert L. "Structural History of the Centralia Area," Report of Investigations No. 172. Illinois State Geological Survey. 1954.

Burger, Ann. M., et al. "Geologic Map of the $1^o x 2^o$ Muncie Quadrangle, Indiana and Illinois, Showing Bedrock and Unconsolidated Deposits." Indiana Geolocial Survey Regional Geological Map No. 5, Muncie Sheet. Map. Indiana Geological Survey. 1966.

Burke, Kevin, and J. F. Dewey. "Plume-Generated Triple Junctions: Key Indicators in Applying Plate Tectonics to Old Rocks," Journal of Geology. 81:406-433. 1973.

Burridge, R., et al. "First Motions From Seismic Sources Near a Free Surface," Bulletin of the Seismological Society of America. 54(6):1889-1913. 1964.

Buschbach, T. C. "New Madrid Seismotectonic Study, Activities During Fiscal Year 1977," Report N4REG-0379. U.S. Nuclear Regulatory Commission. 1977.

Buschbach, T. C. "New Madrid Seismotectonic Study, Activities During Fiscal Year 1979," Report NUREG/CR-0977. U.S. Nuclear Regulatory Commission. 1979.

California Division of Mines and Geology Staff. "Technical Review of the Seismic Safety of the Auburn Damsite," California Division of Mines and Geology Special Publication 54. 1979.

Carr, Jerry E., and DeRoy L. Bergman. "Reconnaissance of the Water Resources of the Clinton Quadrangle, West-Central Oklahoma," Oklahoma Geological Survey Hydrologic Atlas 5. Map. Oklahoma Geological Survey. 1976.

Chandra, Umesh. "Attenuation of Intensities in the United States," Bulletin of the Seismological Society of America. 69(3):2003-2024. 1979.

Chang, Frank K., and Ellis L. Krinitzsky. "State-of-the-Art for Assessing Earthquake Hazards in the United States: Duration, Special Content, and Predominant Period of Strong Motion Earthquake Records from Western United States," Miscellaneous Paper S-73-1, Report 8. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1977.

Chang, Frank K. "State-of-the-Art for Assessing Earthquake Hazards in the United States: Catalogue of Strong Motion Earthquake Records, Vol. 1, Western United States," Miscellaneous Paper S-73-1, Report 9. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1978.

Cheng, Franklin Y., ed. Proceedings of the International Symposium Earthquake Structural Engineering. Extension Division, University of Missouri - Rolla. 1,2. 1976.

Chiburis, E. F. "Preliminary Estimates of Seismic Risk in the Northeast United States," 1979 Midwest Meeting Program. American Geophysical Union, Abstract, Pg. 8, S-9. 1979.

Chinnery, Michael A. "A Comparison of the Seismicity of Three Regions of the Eastern United States," Bulletin of the Seismological Society of America. 69(3):757-772. 1979.

Chopra, Anil K. "Earthquake Response of Concrete Gravity Dams," Report No. EERC 70-1. Earthquake Engineering Research Center. 1970.

Coast and Geodetic Survey. United States Earthquakes, (1946-1968). United States Government Printing Office, Washington, D.C. 1948-1970.

Coast and Geodetic Survey. United States Earthquakes 1928-1945, (3 Volumes). United States Government Printing Office, Washington, D.C. 1968-1969.

Cole, Virgil B. "Configuration of the Top of Pre-cambrian Rocks in Kansas," Kansas Geological Survey Map M-7. Map. Kansas Geological Survey. 1976.

Commonwealth Edison Co. Byron/Braidwood Station (Bryon Units 1 and 2, and Braidwood Units 1 and 2). License Application, PSAR. 1-6. 1973.

Consumers Public Power District. Cooper Nuclear Station. Preliminary Safety Analysis Report. 1968.

Cornell, C. Allin. "Engineering Seismic Risk Analysis," Bulletin of the Seismological Society of America. 58(5):1583-1606. 1968.

Croxton, et al. Excerpts from: Applied General Statistics. Prentice-Hall Inc. Englewood Cliffs, New Jersey. 1967.

Davis, John C. Statistics and Data Analysis in Geology. John Wiley & Sons, Inc. New York, New York. 1973.

Dawson, T. A., et al. "Catalogue of Well Samples of the Indiana Geological Survey," Indiana Geological Survey Directory #8. Indiana Department of Conservation. Bloomington, Indiana. 1960.

Dawson, T. A. "Map of Indiana Showing Structure on Top of Trenton Limestone," Indiana Geoloical Survey Miscellaneous Map, 17. Map. Indiana Geological Survey. 1971.

Degenkolb, H. J. and Associates. Structural Design Seminar on Earthquake Engineering, Part 1 and 2. New York Metropolitan Section, American Society of Civil Engineers. 1971.

Denton, R. C., ed. Abstract Journal in Earthquake Engineering. Earthquake Engineering Research Center. 1-7. 1972-1978.

Department of Water Resources. Proceedings of Conference Earthquake Engineering for Water Projects. The Resources Agency. 1974.

Docekal, Jerry. Earthquakes of the Stable Interior, with Emphasis on the Midcontinent. University of Nebraska, Order No. 71-2880, Ph.D. Thesis. 1970.

DuBois, Susan M. The Origin of Surface Lineaments in Nemaha County, Kansas. University of Kansas, M.S. Thesis (unpublished). Lawrence, Kansas. 1978.

DuBois, Susan M., and Frank W. Wilson. "List of Earthquake Intensities for Kansas, 1867-1977," Kansas Geological Survey Environmental Geology Series 2. Kansas Geological Survey and the University of Kansas. 1978.

Earthquake Data Service. Earthquake Data File, NGSDC/EDS/NOAA, Boulder, Colorado. 1978.

Ervin, Patrick C., and L. D. McGinnis. "Reelfoot Rift: Reactivated Precursor to the Mississippi Embayment," Geological Society of America Bulletin. 86(9):1287-1295. 1975.

Exploration Surveys, Inc. Regional Gravity of State of Arkansas. Dallas, Texas. 1965.

Farquhar, O. C. "The Precambrian Rocks of Kansas," State Geological Survey of Kansas, Bulletin 127, Part 3. Kansas State Geological Survey. 1957.

Fletcher, Jon B., et al. "Seismic Trends and Travel-Time Residuals in Eastern North America and Their Tectonic Implications," Geological Society of America Bulletin. 89(11):1656-1676. 1978.

Fuller, Myron L. "The New Madrid Earthquake," United States Geological Survey Bulletin 494. United States Geological Survey. 1912.

Geological Society of America. Glacial Map of the United States East of the Rocky Mountains. Map. 1979.

Gillerman, Elliot. "Roselle Lineament of Southeast Missouri," Geological Society of America Bulletin. 81(3):975-982. 1970.

Glass, Charles E., and David B. Slemmons. "State-of-the-Art for Assessing Earthquake Hazards in the United States: Imagery in Earthquake Analysis," Miscellaneous Paper S-73-1, Report 11. United States Army Waterways Experiment Station. Vicksburg, Mississippi. 1978.

Gordon, David W., et al. "The South-Central Illinois Earthquake of November 9, 1968: Macroseismic Studies," Bulletin of Seismological Society of America. 60(3):953-971. 1970.

Gray, Henry H., et al. Geologic Map of the 1°x2° Vincennes Quadrangle and Parts of Adjoining Quadrangles, Indiana and Illinois Showing Bedrock and Unconsolidated Deposits. Map. State of Indiana, Department of Natural Resources. 1970.

Gray, Henry H., et al. Geologic Map of the 1°x2° Cincinnati Quadrangle, Indiana and Ohio, Showing Bedrock and Unconsolidated Deposits. Map. State of Indiana, Department of Natural Resources. 1972.

Gubin, Igor E. "Earthquakes and Seismic Zoning," Bulletin of the International Institute of Seismology and Earthquake Engineering. 4:107-126. 1967.

Gupka, Harsh K. and B. K. Rastogi. Dams and Earthquakes: Developments in Geotechnical Engineering, Vol. 11. Elsevier Scientific Publishing Company. 1976.

Gupta, Indra N. "Attenuation of Intensities Based on Isoseismals of Earthquakes in Central United States," Earthquake Notes. 47(3):13-20. 1976.

Gupta, I. N. "Seismic Investigation of Wappapello and Clearwater Dams, Missouri," Report AL-80-2. United States Army Engineer District, Memphis. Memphis, Tennessee. 1980.

Gutenberg, B., and C. F. Richter. "Earthquake Magnitude, Intensity, Energy, and Acceleration," Bulletin of the Seismological Society of America. 46:105. 1956.

Hadley, Jarvis B., and James F. Devine. Earthquake Epicenters, 1800-1972, Seismotectonic Map of the Eastern United States. United States Geological Survey. 1974a.

Hadley, Jarvis B., and James F. Devine. "Seismotectonic Map of the Eastern United States," United States Geological Survey Miscellaneous Field Studies, Map MF-620. Map. United States Geological Survey. 1974b.

Hadley, Jarvis B., and James F. Devine. Tectonic Map, Seismotectonic Map of the Eastern United States. Map. United States Geological Survey. 1974c.

Hafen, Douglas, and Frederick C. Kintzer. Correlations Between Ground Motion and Building Damage. John A. Blume & Associates, Engineers. San Francisco, California. 1977.

Haley, Boyd R., et al. Geologic Map of Arkansas. United States Geological Survey. Arkansas Geological Commission. 1976.

Ham, William E., and James Lee Wilson. "Paleozoic Epeirogeny and Orogeny in the Central United States," American Journal of Science. 265:332-407. 1967.

Haney, Donald C. Recurrent Movement Along the Kentucky River Fault System. Abstract. Eastern Kentucky University, Richmond, Kentucky. 1974.

Hart, Donald L., Jr. "Reconnaissance of the Water Resources of the Ardmore and Sherman Quadrangles, Southern Oklahoma," Oklahoma Geological Survey Hydrologic Atlas 3. Map. Oklahoma Geological Survey. 1974.

Hatheway, Allen W. and Cole R. McClure, Jr., ed. "Geology in the Siting of Nuclear Power Plants," Reviews in Engineering Geology, Volume IV. The Geological Society of America, Boulder, Colorado. 1979.

Havens, John S. "Reconnaissance of the Water Resources of the Lawton Quadrangle, Southwestern Oklahoma," Oklahoma Geological Survey Hydrolodic Atlas 6. Map. Oklahoma Geological Survey. 1977.

Hays, Walter W., et al. "Guidelines for Developing Design Earthquake Response Spectra," Technical Report M-114. Construction Engineering Research Laboratory. Champaign, Illinois. 1974.

Hays, Walter W., "Precedures for Estimating Earthquake Ground Motion," United States Geological Survey Professional Paper 1114. United States Geological Survey. 1980

Hedricks, John. Simple Bouguer Gravity Map of Parts of White and Adjacent Counties, Arkansas. Map. Arkansas Geological Commission and U.S. Geological Survey. 1975.

Heigold, Paul C. "An Aeromagnetic Survey of Southwestern Illinois," Illinois Geological Survey Circular 495. Illinois State Geological Survey. 1976.

Heinrich, Ross R. "A Contribution to the Seismic History of Missouri," Bulletin of the Seismological Society of America. 31(3):187-224. 1941.

Heinrich, Ross R. "Northeastern Ozark Earthquakes," Reprinted from Transactions of the American Geophysical Union. 27(3):320-323. 1946.

Hennes, R. G., ed. Proceedings of the International Conference on Microzonation for Safer Construction Research and Application. Washington University, Seattle, Washington. 1972.

Herrmann, Robert B. "Recurrence Relations," Earthquake Notes. 48(1-2). 1977.

Herrmann, Robert B. and Jose-Antonio Canas. "Focal Mechanism Studies in the New Madrid Seismic Zone," Bulletin of the Seismological Society of America. 68(4):1095-1102. 1978.

Herrmann, Robert B. "Surface Wave Focal Mechanisms for Eastern North American Earthquakes with Tectonic Implications," Journal of Geophysical Research. 84(B7):3543-3552. 1979.

Heyl, A. V., et al. "Regional Structure of the Southeast Missouri and Illinois-Kentucky Mineral Districts," United States Geological Survey Bulletin 1202B. United States Geological Survey. 1965.

Hinze, W. J., et. al. "A Tectonic Overview of the Central Midcontinent," Report NUREG-0382 (R6A). U.S. Nuclear Regulatory Commission. 1977.

Hinze, W. J., et al. "A Bouguer Gravity Map of a Portion of the Central Midcontinent," 1979 Midwest Meeting Program. American Geophysical Union, Abstract, Pg. 7, G-11. 1979.

Hildenbrand, T. G., et al. "Aeromagnetic Map and Associated Depth Map of the Upper Mississippi Embayment Region," United States Geological Survey Miscellaneous Field Studies, Map MF-1158. Map. United States Geological Survey. 1979.

Hildenbrand, T. G., and M. F. Kane. "Tectonics of the Mississippi Valley Graben," 1980 Midwest Meeting Program. American Geophysical Union, Abstract, Pg. 17, GT-8. 1980.

Hofmann, Penner S. "State-of-the-Art for Assessing Earthquake Hazards in the United States; Factors in the Specification of Ground Motions for Design Earthquakes in California," Miscellaneous Paper S-73-1, Report 3. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1974.

House, L. A., and G. R. Keller. "A Regional Geophysical Study of the Illinois Basin," 1980 Midwest Meeting Program. American Geophysical Union, Abstract, Pg. 17, GT-8. 1980.

Housner, G. W., and P. C. Jennings. "Problems in Seismic Zoning," Research Papers Submitted to the 5th World Conference on Earthquake Engineering, Rome, Italy on 25-29 June 1973. California Institute of Technology, Pasadena, California. 1973.

Houston, James R. "State-of-the-Art for Assessing Earthquake Hazards in the United States; Tsunamis, Seiches, and Landslide-Induced Water Waves," Miscellaneous Paper S-73-1, Report 15. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1979.

Howard, K. A., et al. "Preliminary Map of Young Faults in the United States as a Guide to Possible Fault Activity," Miscellaneous Field Studies Map MF-916. Map. United States Geological Survey. 1977.

Illinois Power Company. Clinton Power Station Units 1 and 2; Preliminary Safety Analysis Report. 1,2. 1974.

Illinois State Geological Survey. Structural Features of the Eastern Interior Region of the United States. 1971.

Indiana Department of Conservation. Deep Test Well in Lawrence County, Indiana: Drilling Techniques and Stratigraphic Interpretations. 1960.

Iowa Geological Survey. Geologic Map of Iowa. Map. 1969.

Iowa Gravity Stations Original - 15th Degree Residual Map. Map. United States Geological Survey. 1950.

Johnson, Gerald H., and Stanley J. Keller. "Geologic Map of the 1°x2° Fort Wayne Quadrangle, Indiana, Michigan, and Ohio, Showing Bedrock and Unconsolidated Deposits," Indiana Geological Survey Regional Map No. 8, Fort Wayne Sheet. Map. Indiana Geological Survey. 1972.

Johnson, Robert W., Jr., and Richard G. Stearns. Bouguer Gravity Anomaly Map of Tennessee. Map. Tennessee Division of Geology. 1967.

Johnson, R. W., Jr., et. al., "Aeromagnetic Map of the East-Central Midcontinent of the United States," Report NUEWG/CR-1662. U.S. Nuclear Regulatory Commission. 1980.

Johnson, Stanley J., et al. "Reservoirs and Induced Seismicity at Corps of Engineers Projects," Miscellaneous Paper S-77-3, Final Report. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1977.

Johnston, Arch C. "The New Madrid Rift South of 35.5°N: First-Year Results of the Memphis Area Regional Seismic Network," 1980 Midwest Meeting Program. American Geophysical Union, Abstract, Pg. 19, S-5. 1980.

Keller, G. R., et. al. "Bouguer Gravity Anomaly Map of the East-Central Midcontinent of the United States," Report NUREG/CR-1663. U.S. Nuclear Regulatory Commission. 1980.

Kerr, Richard A. "U.S. Earthquake Hazards: Real But Uncertain in the East," Science. 201:1001-1003. 1978.

Keys, John N. An Analysis of the Rend Lake Fault System in Southern Illinois. University of Illinois, M.S. Thesis (unpublished). Urbana, Illinois. 1978.

King, Phillip B. "Tectonics of Quaternary Time in Middle North America," pp. 831-870 in Wright, H. E., Jr., and D. G. Frey., eds. The Quarternary of the United States. Princeton University Press, Princeton, New Jersey. 1965.

Kisslinger, Carl. "Earthquake Prediction," Physics Today. 27:36-42. 1974.

Knopoff, L. "The Statistics of Earthquakes in Southern California," Bulletin of the Seismological Society of America. 54(6):1871-1873. 1964.

Krinitzsky, E. L. "State-of-the-Art for Assessing Earthquake Hazards in the United States: Fault Assessment in Earthquake Engineering," Miscellaneous Paper S-73-1, Report 2. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1974.

Krinitzsky, Ellis L., and Frank K. Chang. "State-of-the-Art for Assessing Earthquake Hazards in the United States: Earthquake Intensity and the Selection of Ground Motions for Seismic Design," Miscellaneous Paper S-73-1, Report 4. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1975.

Krinitzsky, Ellis, and David M. Patrick. "Earthquake Investigations at the Dickey Lincoln School, Damsites, Maine," Miscellaneous Paper S-77-2. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi: 1977a.

Krinitzsky, Ellis L., and Frank K. Chang. "State-of-the-Art for Assessing Earthquake Hazards in the United States: Specifying Peak Motions for Design Earthquakes," Miscellaneous Paper S-73-1, Report 7. United States Army Engineer Waterways Experiment Stations. Vicksburg, Mississippi. 1977b.

Krinitzsky, E. L., et al. Geological-Seismological Investigation of Earthquake Hazards at Sardis Dam, Mississippi. United States Army Engineer District, Vicksburg. Vicksburg, Mississippi. 1979.

Kulhawy, Fred H., and Avram Ninyo. "Earthquakes and Earthquake Zoning in New York State," Bulletin of the Association of Engineering Geologists. 14(2):69-87. 1977.

Landers, Glenn B., and Joseph R. Curro, Jr. "In Situ Seismic Investigation Isabella Project, California," Miscellaneous Paper S-78-16. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1977.

Lawson, James E., Jr., et al. Catalog of Oklahoma Earthquakes, University of Oklahoma, Earth Sciences Observatory. 1977.

Lee, Wallace. "Stratigraphy and Structural Development of the Saline Basin Area," Kansas State Geological Survey Bulletin 121. State Geological Survey of Kansas. 1956.

Leeds, David J., ed. Earthquake Engineering Research Institute Newsletter. Berkeley, California. 12-14. 1978 through present.

Liu, Ben-Chieh. Earthquake Risk and Damage Functions: An Integrated Preparedness and Planning Model Applied to New Madrid, Final Report. Midwest Research Institute. Kansas City, Missouri. 1979.

Lyons, Paul L., et al. "Vertical-Intensity Magnetic Map and Bouguer Gravity-Anomaly Map of Oklahoma," Oklahoma Geological Survey Map GM-6, GM-7, with text. Map. Oklahoma Geological Survey. 1964.

Maksoudian, Leon Y. Probability and Statistics with Applications, International Textbook Company. New York, New York. 1969.

Mann, Clarke O. Seismic Factors Concerning the Foundations of Structures: Engineering Seismology and Geotechnical Factors of the Central Mississippi Valley Seminar. Association of Engineering Geologists. St. Louis, Missouri. 1977.

Marcher, Melvin V. "Reconnaissance of the Water Resources of the Fort Smith Quadrangle, East-Central Oklahoma," Oklahoma Geological Survey Hydrologic Atlas 1. Map. Oklahoma Geological Survey. 1969.

Marcher, Melvin V., and Roy H. Bingham. "Reconnaissance of the Water Resources of the Tulsa Quadrangle, Northeastern Oklahoma," Oklahoma Geological Survey Hydrologic Atlas 2. Map. Oklahoma Geological Survey. 1971.

Marcuson, W. F. III. An Introduction to Response Spectra and Design Earthquakes. Association of Engineering Geologists. St. Louis, Missouri. 1977.

Marcuson, William F. III. "Visit to Japan to Observe Damage Which Occurred During the Near Izu Oshima Earthquakes, January 14 & 15, 1978," Miscellaneous Paper GL-79-20. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1979.

McCracken, Mary H. "Structural Features of Missouri," Missouri Water Resources Report of Investigations 49. Missouri Geological Survey and Water Resources. 1971.

McGinnis, L. D. "Tectonics and the Gravity Field in the Continental Interior," Journal of Geophysical Research. 75(2):317-331. 1970.

McGinnis, L. D., and Patrick C. Ervin. "Earthquakes and Block Tectonics in the Illinois Basin," Geology. 2:517-519. 1974.

McGinnis, L. D., et al. "Free-Air Gravity of Illinois," Illinois Geological Survey Circular 494. Illinois State Geological Survey. 1976a.

McGinnis, L. D., et al. The Gravity Field and Tectonics of Illinois. Illinois State Geological Survey. 1976b.

McGinnis, L.D. "Energy Release Rates For Earthquakes in the Mississippi Enbayment Region," 1979 Midwest Meeting Program. American Geophysical Union, Abstract. 1979.

McGuire, Robin K. "FORTRAN Computer Program for Seismic Risk Analysis," United States Geological Survey Open-File Report 76-67. United States Geological Survey. 1976.

McGuire, Robin K. "FRISK: Computer Program For Seismic Risk Analysis Using Faults as Earthquake Sources," United States Geological Survey Open-File Report 78-1007. United States Geological Survey. 1978.

McGuire, Robin K. "Adequacy of Simple Probability Models for Calculating Felt-Shaking Hazard, Using the Chinese Earthquake Catalog," Bulletin of the Seismoloigcal Society of America. 69(3):877-892. 1979.

McKeown, F. A. "Hypothesis: Many Earthquakes in the Central and Southeastern United States are Casually Related to Mafic Intrusive Bodies," Journal of Research, U.S. Geological Survey. 6(2):41-50, February, 1978.

Mead, Judson, M. E. Biggs, and P. G. Halloway. Map of Indiana Showing Average Magnetic Intensity. Map. Indiana Geological Survey. 1953.

Melhorn, Wilton N., and Ned M. Smith. The Mt. Carmel Fault and Related Structural Features in South-Central Indiana. Map. Indiana Department of Conservation. Bloomington, Indiana. 1959.

Miller, Richard K. and Stephen F. Felszeghy. "Engineering Features of the Santa Barbara Earthquake of August 13, 1978," Newsletter. Earthquake Engineering Research Institute. 1978.

Miller, Robert A., et al. Geologic Map of Tennessee, West Central Sheet. Map. Tennessee Division of Geology. 1966a.

Miller, Robert A., et al. Geologic Map of Tennessee, West Sheet. Map. Tennessee Division of Geology. 1966b.

Missouri Geological Survey and Water Resources. Gravimetric Map of Missouri. Map. 1943.

Missouri Geological Survey and Water Resources. Aeromagnetic Contour Map, Total Intensity, Southeastern Missouri. Map. Rolla, Missouri. 1961.

Missouri Geological Survey and Water Resources. Geologic Map of Missouri. Map. 1979.

Miser, Hugh D., et al. Geologic Map of Oklahoma. Map. United States Geological Survey, and the Oklahoma Geological Survey. 1954.

National Oceanic and Atmospheric Administration. "Contributions to Seismic Zoning," Technical Report ERL 267-ESL 30. 1973.

National Oceanic and Atmospheric Administration and Environmental Data Service. Earthquake History of the United States (thru 1970). United States Government Printing Office, Washington, D.C. 1972.

National Oceanic and Atmospheric Administration and Environmental Data Service. United States Earthquakes, 1969-1972. United States Government Printing Office, Washington, D.C. 1971-1974.

National Oceanic and Atmospheric Administration and United States Geological Survey. United States Earthquakes, (1973-1977). United States Government Printing Office, Washington, D.C. 1975-1979.

Nevers, George M., and Richard D. Walker. Annotated Bibliography of Indiana Geology Through 1955. Indiana Department of Conservation. Bloomington, Indiana. 1962.

Neville, Adam M., and John B. Kennedy. Basic Statistical Methods for Engineers and Scientists. International Textbook Company, New York, New York. 1964.

Nuttli, Otto W. "Seismic Wave Attenuation and Magnitude Relations for Eastern North America," Journal of Geophysical Research. 78:876-885. 1973a.

Nuttli, Otto W. "State-of-the-Art for Assessing Earthquake Hazards in the United States; Design Earthquakes for the Central United States," Miscellaneous Paper S-73-1, Report 1. United States Army Engineer Waterways Experiment Station. Vicksburg, Missouri. 1973b.

Nuttli, Otto W. "The Mississippi Valley Earthquakes of 1811 and 1812: Intensities, Ground Motion and Magnitudes," Bulletin of the Seismological Society of America. 63(1):227-248. 1973c.

Nuttli, Otto W. "Magnitude-Recurrence Relation for Central Mississippi Valley Earthquakes," Bulletin of the Seismological Society of America. 64(4):1189-1207. 1974a.

Nuttli, Otto W., and James E. Zollweg, "The Relation Between Felt Area and Magnitude for Central United States Earthquakes," Bulletin of the Seismological Society of America. 64(1):73-85. 1974b.

Nuttli, Otto W. "Comments on Seismic Intensities, 'Size' of Earthquakes and Related Parameters, by Jack F. Evernden," Bulletin of the Seismological Society of America. 66(1):331-338. 1976.

Nuttli, Otto W., and John J. Dwyer. "State-of-the-Art for Assessing Earthquake Hazards in the United States; Attenuation of High-Frequency Seismic Waves in the Central Mississippi Valley," Miscellaneous Paper S-73-1, Report 10. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1978a.

Nuttli, Otto W., and Robert Herrmann. "State-of-the-Art for Assessing Earthquake Hazards in the United States: Credible Earthquakes for the Central United States," Miscellaneous Paper S-73-1, Report 12. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1978b.

Nuttli, Otto W., et al. "On the Relation Between Modified Mercalli Intensity and Body-Wave Magnitude," Bulletin of the Seismological Society of America. 69(3):893-909. 1979a.

Nuttli, Otto W. "Seismicity of the Central United States," Geological Society of America Reviews in Engineering Geology. 4:67-93. 1979b.

Nuttli, Otto W. "State-of-the-Art for Assessing Earthquake Hazards in the United States; the Relation of Sustained Maximum Ground Acceleration and Velocity to Earthquake Intensity and Magnitude," Miscellaneous Paper S-73-1, Report 16. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1979c.

Nuttli, O. W. "Historical Seismicity of the Central Unites States," 1980 Midwest Meeting Program. American Geophysical Union, Abstract, Pg. 18, S-1. 1980.

Ohio Division of Geological Survey. Gravity Map of Ohio, Bouguer Anomalies in Ohio. Map. 1956a.

Ohio Division of Geological Survey. Gravity Map of Ohio, Free Air Anomalies in Ohio. Map. 1956b.

Okrent, David. "A Survey of Expert Opinion on Low Probability Earthquakes," Report UCLA-ENG-7515. University of California. 1975.

O'Leary, Dennis W., and Shirley L. Simpson. "Remote Sensor Applications to Tectonism and Seismicity in the Northern Part of the Mississippi Embayment," Geophysics. 42(3):542-548. 1977.

Olive, Wilds W. "Geologic Map of the Wickliffe Quadrangle, Kentucky-Missouri and the Part of the Wyatt Quadrangle in Kentucky," United States Geological Survey Quadrangle Map GQ-1161. Map. United States Geological Survey. 1974.

Patrick, David M. "Microearthquake Monitoring at Corps of Engineers Facilities," Technical Report S-77-2, Interim Report. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1977.

Public Service Indiana. Marble Hill Nuclear Generating Station Units 1 and 2; Preliminary Safety Analysis Report. 1, 2, and 2a. 1975.

Richardson, Jr. N. R. Total Magnetic Intensity Anomaly Map of Indiana. Department of Geosciences, Purdue University. 1978.

Richter, Charles F. Elementary Seismology. W. H. Freeman and Company. San Francisco, California. 1958.

Richter, C. F. "Seismic Regionalization," Bulletin of the Seismological Society of America. 49(2):123-162. 1959.

Rudman, Albert J. "A Seismic Reflection Survey of the Surface of the Basement Complex in Indiana," Indiana Geological Survey Report of Progress No. 18. Indiana Department of Conservation. 1960.

Russ, David P. "Late Holocene Faulting and Earthquake Recurrence in the Reelfoot Lake Area, Northwestern Tennessee," Geological Society of America Bulletin. 90(1):1013-1018. 1979.

St. Louis University, Department of Earth and Atmospheric Sciences. Southeast Missouri Regional Seismic Network, Quarterly Bulletin, Nos. (1-latest issue). 1974 through present.

Sargent & Lundy Engineers. Supplemental Discussion Concerning the Limit of the Northern Extent of Large Intensity Earthquakes Similar to the New Madrid Events. Chicago, Illinois. 1975.

Sass, J. H., et. al., "A New Heat-Flow Contour Map of the Conterminous United States," United States Geological Survey Open-File Report 76-756. United States Geological Survey. 1976.

Sawyer, H. H., et al. Map of Indiana Showing Data Used in Compiling Miscellaneous Map No. 5. Map. Indiana Geological Survey. 1951.

Sawyer, H. H., et al. Map of Indiana Showing Gravitational Intensity. Map. Indiana Geological Survey. 1953.

Sbar, Marc L., and Lynn R. Sykes. "Contemporary Compressive Stress and Seismicity in Eastern North America: An Example of Intraplate Tectonics," Geological Society of America Bulletin. 84(6):1861-1882. 1973.

Schaefer, Stephen F., and Robert B. Herrmann. "Seismic Risk Analysis Applied to the Central United States," Earthquake Notes. 43(4). 1977.

Schneider, Allan F., and Stanley J. Keller. "Geologic Map of the $1^{o}x2^{o}$ Chicago Quadrangle, Indiana, Illinois, and Michigan, Showing Bedrock and Unconsolidated Deposits," Illinois Geological Survey Regional Geological Map No. 4. Map. Indiana Geological Survey. 1970.

Seed, H. Bolton, et al. Relationships Between Maximum Acceleration, Maximum Velocity, Distance from Source and Local Site Conditions for Moderately Strong Earthquakes. Sponsored by the National Science Foundation. University of California, Berkeley, California. 1975.

Seed, H. Bolton, and W. H. Peacock. "Applicability of Laboratory Test Procedures for Measuring Soil Liquefaction Characteristics Under Cyclic Loading," Report No. EERC 70-8. Earthquake Engineering Research Center. 1970.

Sexton, J. L., et al. "Crustal Models of the Wabash River Valley Area from Seismic Refraction Date," 1980 Midwest Meeting Program. American Geophysical Union, Abstract, Pg. 18, S-2. 1980.

Sherard, J. L., et al. "Potentially Active Faults in Dam Foundations," Geotechnique. 24(3):367-428. 1974.

Sherif, Mehmet (ed.). Proceedings of the Second International Conference on Microzonation for Safer Construction - Research and Applications. 1-3. San Francisco, California. 1978.

Sherif, M. A., and R. C. Bostrom (ed.). Proceedings of International Conference on Microzonation for Safer Construction - Research and Applications. Seattle, Washington. 1972.

Shukla, D. K., et al. "Safe Shutdown Earthquake Loading: Deterministic and Probabilistic Evaluations," Third International Conference on Structural Mechanics in Reactor Technology. North Holland Publishing Company, American Elsevier Publishing Inc. 1975.

Singh, V. N., et al. "Seismic Risk Analysis - A Review," Bulletin of the Indian Society of Earthquake Technology. 13(2):35-44. 1976.

Slemmons, David B. "State-of-the-Art for Assessing Earthquake Hazards in the United States: Faults and Earthquake Magnitude," Miscellaneous Report S-73-1, Report 6. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1977a.

Slemmons, David B., and Roy McKinney. "Definition of 'Active Fault,'" Miscellaneous Paper S-77-8. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1977b.

Snyder, Frank G. "Tectonic History of Midcontinental United States," UMR Journal. (1):65-76. 1968.

Stauder, William, and Otto W. Nuttli. "Seismic Studies: South Central Illinois Earthquake of November 9, 1968," Bulletin of the Seismological Society of America. 60(3):973-981. 1970.

Stearns, Richard G., and Charles W. Wilson, Jr. "Quantitative Analysis of Ordovician and Younger Structural Development of Nashville Dome, Tennessee," Bulletin of the American Association of Petroleum Geologists. 47(5):823-832. 1963.

Stearns, Richard G., and Charles W. Wilson, Jr. "Relationship of Earthquakes and Geology in West Tennessee and Adjacent Areas," Tennessee Valley Authority Report. 1972.

Stepp, J. C. "Analysis of Completeness of the Earthquake Sample In the Puget Sound Area," National Oceanic and Atmospheric Administration. Technical Report ERL 267-ESL 30. Boulder, Colorado. 1973.

Stonehouse, H. B., and G. M. Wilson. "Faults and Other Structures in Southern Illinois - A Compilation," Illinois State Geological Survey Circular 195. Map. Illinois State Geological Survey. 1955.

Stover, Carl W. "Seismicity Map of the Conterminous United States and Adjacent Areas," Miscellaneous Field Studies, Map MF-812, Conterminous U.S. and Adjacent Areas. Map. United States Geological Survey. 1977.

Stover, C. W., et al. "Seismicity Map of the State of Arkansas," United States Geological Survey Miscellaneous Field Studies, Map MF-1154. Map. United States Geological Survey. 1979a.

Stover, C. W., et al. "Seismicity Map of the State of Illinois, Scale 1:1,000,000," United States Geological Survey Miscellaneous Field Studies, Map MF-1143. Map. United States Geological Survey. 1979b.

Stover, C. W., et al. "Seismicity Map of the State of Indiana, Scale 1:1,000,000," United States Geological Survey Miscellaneous Field Studies, Map MF-1145. Map. United States Geological Survey. 1979c.

Stover, C. W., et al. "Seismicity Map of the State of Kentucky, Scale 1:1,000,000," United States Geological Survey Miscellaneous Field Studies, Map MF-1143. Map. United States Geological Survey. 1979d.

Stover, C. W., et al. "Seismicity Map of the State of Missouri, Scale 1:1,000,000," United States Geological Survey Miscellaneous Field Studies, Map MF-1155. Map. United States Geological Survey. 1979e.

Stover, C. W., et al. "Seismicity Map of the State of Ohio, Scale 1:1,000,000," United States Geological Survey Miscellaneous Field Studies, Map MF-1142. Map. United States Geological Survey. 1979f.

Stover, C. W., et al. "Seismicity Map of the State of Tennessee, Scale 1:1,000,000," United States Geological Survey Miscellaneous Field Studies, Map MF-1157. Map. United States Geological Survey. 1979g.

Street, Ronald L., et al. "Earthquake Mechanics in the Central United States," Science. 184(4143):1285-1287. 1974.

Street, R., and J. Zollweg. "The Sharpsburg, Kentucky, Earthquake Sequence of July-August, 1980: A Preliminary Report," 1980 Midwest Meeting Program. American Geophyscial Union, Abstract, Pg 19, S-4. 1980.

Swingle, George D., et al. Geologic Map of Tennessee, East Central Sheet. Map. Tennessee Division of Geology. 1966a.

Swingle, George D., et al. Geological Map of Tennessee, East Sheet. Map. Tennessee Division of Geology. 1966b.

Sykes, Lynn R., and Mark L. Sbar. "Intraplate Earthquakes, Lithospheric Stresses and the Driving Mechanism of Plate Tectonics," Nature. 245:298-302. 1973.

Tikrity, Sammi S. Tectonic Genesis of the Ozark Uplift. Washington University, Ph.D. Thesis (unpublished). St. Louis, Missouri. 1968.

Union Electric Company. Callaway Plant Units 1 and 2 Addendum, Standerdized Nuclear Unit Power Plant System (SNUPPS), Preliminary Safety Analysis Report. 2. 1974.

United States Geological Survey. Iowa Gravity Stations and Simple Bouguer Contours. Map. 1950.

United States Geological Survey. Aeromagnetic Map of the New Madrid Region, Missouri - Kentucky - Arkansas - Tennessee. Map. 1974.

United States Geological Survey. Preliminary Determination of Epicenters, Monthly Listing. United States Government Printing Office, Washington, D.C. January, 1975-December, 1977.

United States Geological Survey. "Aeromagnetic Map of Iowa," Map GP-910. Map. 1976.

United States Geological Survey. Earthquake Information Bulletin. 9-present. 1977-1980.

Vanmarcke, Erik H. "State-of-the-Art for Assessing Earthquake Hazards in the United States: Representation of Earthquake Ground Motion: Scaled Accelerograms and Equivalent Response Spectra," Miscellaneous Paper S-73-1, Report 14. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1979.

Varma, Madan M. Seismicity of the Eastern Half of the United States. Indiana University, Ph.D. Thesis (unpublished). Bloomington, Indiana. 1975.

Von Frese, R. R. B., et al. "Mississippi Embayment Crustal Structure from Satelite Elevation, Gravity and Magnetic Anomaly Data," 1980 Midwest Meeting Program. American Geophysical Union, Abstract, Pg. 16, R-10. 1980.

Walper, Jack L. "State-of-the-Art for Assessing Earthquake Hazards in the United States: Plate Tectonics and Earthquake Assessment," Miscellaneous Paper S-73-1, Report 5. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1976.

Wayne, William J., et al. "Geologic Map of the $1^{o}x2^{o}$ Danville Quadrangle, Indiana and Illinois, Showing Bedrock and Unconsolidated Deposits," Indiana Geological Survey Regional Geologic Map No. 2, Danville Sheet. Map. Indiana Geological Survey. 1966.

Whitman, Robert R., et al. Preliminary Correlations Between Earthquake Damage and Strong Ground Motion. National Science Foundation. 1977.

Whitman, Robert V., et al. Seismic Design Regionalization Maps for the United States. Map. 1976.

Wiegel, Robert L. Earthquake Engineering. Prentice-Hall, Inc., Englewood Cliffs, New Jersey. 1970.

Wier, Charles E., and Henry H. Gray. "Geologic Map of the Indianapolis $1^{o}x2^{o}$ Quadrangle, Indiana and Illinois, Showing Bedrock and Unconsolidated Deposits," Indiana Geological Survey Regional Geologic Map 1. Map. Indiana Department of Conservation. 1961.

Wiggins, John H., Jr. "Construction of Strong Motion Response Spectra From Magnitude and Distance Data," Bulletin of the Seismological Society of America. 54(5):1257-1269. 1964.

Wilson, Charles W., Jr. and Richard G. Stearns. "Quantitative Analysis of Ordovician and Younger Structural Development of Nashville Dome, Tennessee," Bulletin of the American Association of Petroleum Geologists. 47(5):823-832. 1963.

Wilson, Frank W. A Study of Regional Tectonics and Seismicity of Northeastern Kansas. Kansas Geological Survey. 1976.

Winkler, Louis. "Catalog of United States Earthquakes Before the Year 1850," Bulletin of the Seismological Society of America. 69(2):569-602. 1979.

Yanev, Peter I. "The Lice, Turkey, Earthquake of September 6, 1975 (Reconnaissance Report)," Newsletter. Earthquake Engineering Research Institute. 9(6B). 1975.

Yanev, Peter I. ed. "Miyagi-Ken-OKI, Japan Earthquake of June 12, 1978," Newsletter. Earthquake Engineering Research Institute. 1978.

Yarger, H. L., et al. Aeromagnetic Map of Eastern Kansas. Map. Kansas Geological Survey. 1978.

Yegian, M. K. "State-of-the-Art for Assessing Earthquake Hazards in the United States; Probabilistic Seismic Hazards Analysis," Miscellaneous Paper S-73-1, Report 13. United States Army Engineer Waterways Experiment Station. Vicksburg, Mississippi. 1979.

Zietz, Isidore, et al. "Aeromagnetic Map of Iowa: Color Coded Intensitities," United States Geological Survey Map GP-411. Map. United States Geological Survey. 1976.

Zoback, Mark D. "Recurrent Faulting in the Vicinity of Reelfoot Lake, Northwestern Tennessee," Geological Society of America Bulletin, Part 1. 90(11):1019-1024. 1979.

Zoback, M. D., et al. "Recurrent Intraplate Tectonism in the New Madrid Seismic Zone," Science. 209(4460):971-976. 1980.